Title: Urban regeneration and psychological mechanisms associated with 'urbanicity' effect.

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Finally, in thanks to my maternal grandparents, for without their strength and resilience I would not exist, I dedicate this work to all the people who, just as my grandparents did, find themselves refugees overnight.

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Thesis Overview

This thesis consists of two chapters, a systematic review and an empirical paper, with additional information and supporting documents contained within the appendices. Both chapters are intended for publication in PLOS ONE and therefore written using the appropriate author guidelines (Appendix A) and the Vancouver style of referencing is therefore used throughout.

The demand for mental health services in the UK continues to grow, as do the pressures on the NHS to continue to meet this demand, however, there is a compelling argument that psychological therapies should be one of many interventions that target the cumulative influences on mental health throughout the life course (1). It is recognised that advantage, or disadvantage starts before birth and accumulates through life, thus interventions at the earliest stage to reduce disadvantage, will generate the greatest subsequent benefits in improving physical and mental health and reducing inequalities (1,2). An aspect of our daily living, which has been associated with deleterious effects on mental health and wellbeing is our urban environment, evidenced by an increased likelihood of developing common and severe mental health disorders (3–5). While historically, significant gains have been made in relation to control of infectious diseases, with housing and sanitation improvements in our cities, mental health has not seen the same priority (6). Daily living conditions, including housing, have more recently been identified as important social determinants of mental health and included in recommendations for action (2). There is, therefore, a growing need for housing and urban environmental planning and design to be key aspects of public health intervention.

Urban regeneration is one form of intervention used to provide area level improvement, often including improved housing. The impact of urban regeneration and housing interventions on health and mental health has been the subject of a number of systematic reviews (7–9). Existing reviews have demonstrated improvements to mental health in relation to targeted housing interventions, with inconsistent evidence for the impact of urban regeneration. One area that has been overlooked by earlier reviews is the impact of urban regeneration on the mental health of BME

groups. Chapter 1 therefore aims to synthesise the quantitative evidence on the impact of urban regeneration on the mental health of BME groups. The findings from the systematic review demonstrated a significant lack of research in this area and highlights that inequality can only be targeted if all groups are included. Chapter 2 aims to explore psychological mechanisms thought to underpin the association between urban environments and mental health. The empirical paper demonstrated that briefly contemplating images of urban environments influences our consideration of future consequences, sense of personal control and attention to threat, thereby contributing to existing research concerning the urbanicity effect (3,10).

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What about the detail? A systematic review of the impact of urban regeneration programs on the mental health of BME groups.

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Abstract

There is a growing emphasis at a national and international level on the need to redress inequality in mental health with calls for interventions to tackle the key social determinants of mental health, including daily living conditions. Urban regeneration is an intervention that typically includes improvement to housing and living conditions, and it can, therefore, be regarded as a key source of evidence on the health and wellbeing impacts of the living environment. One aspect that seems to be missing from existing reviews, is the impact of urban regeneration on the mental health of Black Minority Ethnic (BME) groups. The aim of this systematic literature review was therefore to investigate this area. Twelve articles were included for review following systematic searches of three databases. Findings from this review supports existing evidence of the potential for targeted housing interventions to increase warmth and energy efficiency and, therefore, the potential to lead to improvements in mental health for vulnerable individuals. In relation to England and Scotland, six studies support existing evidence of the over-representation of minority and BME households living in deprived neighbourhoods. The results from this review support findings from previous systematic reviews, that there is a lack of consistent evidence of improvements to mental health following urban regeneration. The diversity of aims, methods and outcomes measured in the study's available, limits the generalisability of findings. The lack of available studies which consider BME groups in relation to mental health and urban regeneration highlights the need to consider the ethnicity-related health and wellbeing inequalities impact of regeneration programme as a matter of some urgency.

Introduction

Trends in prevalence rates of common mental health disorders (CMD) in England indicate differential increases across gender and ethnicity (1). Since the last survey in 2000, rates of CMD's have steadily increased for women and remained broadly stable for men with this sex-based inequality now standing at approximately 1:5 women compared with 1:8 men (1). Prevalence rates for women across different ethnic groups vary greatly, however, rates for men across all ethnic groups are more equal (1). Approximately 29% of Black and Black British and 28% of Mixed and Other women in the sample reported CMD symptoms, with much lower rates of 15% for White Other, 20% and 23% for White British and Asian or British Asian women respectively (2). Treatment rates for mental health also vary, with Black and Minority Ethnic (BME) groups reporting lowest treatment rates. In addition to high prevalence rates of CMD's among BME groups in England (1), lower levels of wellbeing are reported across the social gradient for BME groups (3). The "structural, societal and systemic factors" of racial discrimination are cited as critical factors driving lower levels of reported wellbeing (3, p 28).

The terms race, ethnicity or BME as well as others including Asian, Afro-Caribbean and Black, describe diverse populations. They encompass groups often described as first, second or third-generation inpatriates, asylum seekers or refugees. The heterogenic and fluid nature of ethnicity makes it difficult to both accurately define and measure, however, this should not preclude the importance of accounting for ethnicity in research (4,5). The term White is similarly highlighted by researchers as describing a heterogenic group (6). The term ethnicity is also used interchangeably with race and there are differing opinions on whether these terms describe different or overlapping concepts (7). A systematic review of public health research found a high number of researchers using the terms race or ethnicity, there was, however, a lack of explanation of why the chosen terms were used, the purpose for the inclusion of the term, and little discussion of significant findings or implications (7). Comstock et al. (7) conclude that attributing health disparities to race or ethnicity leads to a failure to account for the underlying causes of these disparities. Some researchers have

stressed the importance of not reducing samples to simple ethnic or racial labels and propose that meaningful descriptions are used to describe each population sample, together with information as to how and why those racial or ethnic categories have been ascribed (6). While there are arguments for and against differentiating participants by race or ethnicity, ignoring it increases the risk that the needs of certain minority groups will be overlooked (8).

For BME groups, the longstanding lack of parity of esteem between mental health and physical health problems is compounded by difficulties accessing and receiving appropriate mental health care and treatment (9). Efforts for improvement have predominantly focused on access to services, service delivery and cultural competence (9). There is also the wider context of health inequality, with lower socioeconomic position associated with poor mental health (10). The UK Government's "No Health Without Mental Health" strategy document (11) recognises that there is an interaction between a person's identity and their experience of inequality. Although the term is not used explicitly, the strategy document acknowledges both the theory and reality of intersectionality, acknowledging that BME groups are more likely to live in deprived areas and have negative experiences, both as a result of their ethnic identity and because of their socio-economic status and living environment (11). Adding evidence from the UK and USA, Nazroo (12) suggests that to fully understand the relationship between socioeconomic inequalities and ethnic inequalities in health, the influence of racial discrimination must be taken into account. In relation to the English health system, there is continued criticism that the primary focus on socioeconomic factors in relation to health inequality ignores crucial factors such as ethnicity and there are calls for an integrated approach to considering health inequality and equality and diversity both at a national and local level (13).

Race, religion and belief are included in the nine protected characteristics set out by the Equality Act (2010), and it is acknowledged that there is a duty to reduce inequality in relation to these protected characteristics (11). Using the Index of Multiple Deprivation 2010 (IMD 2010), evidence from the 2011 census confirms that all minority ethnic groups in England are more likely to live in deprived neighbourhoods compared with the White British population, with Bangladeshi and Pakistani groups significantly overrepresented in deprived neighbourhoods compared with other

groups (14). The IMD 2010 explores deprivation across seven domains, income, employment, health, education, barriers to housing and services, crime and living environment. Pakistani groups are more likely to live in neighbourhoods deprived due to the living environment, education, health and employment, whereas Bangladeshi groups are more likely to live in areas deprived due to low income and barriers to housing and services (14). The disparity between different ethnic groups in neighbourhoods that are not considered deprived is also evidenced. For example, the Asian ethnic group has worse labour market outcomes in those better neighbourhoods than the White British group and Mixed and Black ethnic groups both have worse labour market outcomes regardless of whether they lived in deprived or non-deprived areas (14).

A key definition of health, which sits at the heart of the renewed focus on the social determinants of health and mental health and inequality is the World Health Organisation's (15) definition of health as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity". The WHO also states that achieving the highest level of health is a fundamental right for all (15). Approaches to reducing mental health inequality include targeting those inequalities considered to be the social determinants of mental health (11). The Commission on Social Determinants of Health (16) propose three overarching recommendations aimed at improving living conditions, addressing the inequity of wealth and resource and fully assessing both the problem and impact of change. A further report focused on the social determinants of mental health, draws together evidence of how social determinants can impact on individuals throughout their life span in a cumulative manner, in relation to their wellbeing and mental health (17). The report proposes a multilevel framework for both understanding social determinants of mental ill-health and informing strategies and interventions to reduce mental disorders and improve wellbeing.

Within the WHO report on social determinants of mental health, their multilevel framework highlights housing as an area for intervention (17). The annual cost of poor housing to the National Health Service (NHS), has risen from an estimated £600 million in 2010 to £1.4 billion in 2015 (18). In relation to the state of housing for the BME population, there is consistent evidence of poor-quality housing and overcrowding. For example, Bangladeshi and Black African homes were found to be

seven times more over-crowded compared to White British homes and BME homes twice as likely to be severely overcrowded (19–22). As a result of this and other factors, the estimated cost of inadequate housing to the NHS in relation to BME households was £51 million in 2014 (23). Changing trends in housing tenure are also reported, indicating the greatest proportional increase since 1991 in private renting for people from Indian, Pakistani and Black Caribbean populations (24). Based on the Housing Health and Safety Rating System (HHSRS), accommodation with a category 1 hazard is classified as poor housing (23). Although there were no significant differences across ethnicities in category 1 hazards, when conditions were considered according to tenure, 18% of BME households were living in private sector homes classified as poor housing, compared with 8% of those living in public sector homes (23). Discrimination in the housing market also exists and limits the housing and area choices available to ethnic minority groups. Exploring ethnic discrimination in the London housing market, researchers found high levels of ethnic discrimination with the degree of discrimination dependent on occupation and the ethnic density of the area in question (25). In addition to housing-related problems experienced by BME groups, they are also more likely to be homeless (26). A report by Shelter (26) highlights that, in terms of numbers of households identified as homeless, BME households are overrepresented and continues to increase. When the number of households identified as homeless is compared across different ethnic groups, there are clear differences, for example, households identifying as Black African/Caribbean or Other non-white are particularly overrepresented (26).

Urban regeneration is one form of intervention used to provide area level improvement, often including improved housing. Urban regeneration is defined as "a comprehensive and integrated vision and action which leads to the resolution of urban problems and seeks to bring about a lasting improvement in the economic, physical, social and environmental condition of an area that has been subject to change" (18, p 17). Whilst this definition captures the essence of regeneration, it tends to emphasize the ambition and not the measurable outcomes of these programmes. There is also evidence that it is common during regeneration programmes for one or two factors to be the key drivers which shape and inform the focus of regeneration. These are most often in economic or

physical form (27). There has also been an expectation that other issues such as social problems like crime and antisocial behaviour will be resolved as a by-product of regeneration. Both the nature and content of the practice of urban regeneration continues to evolve and is heavily influenced by a number of factors including policy and economics (27). The Commission for Racial Equality's report on regeneration and racial equality concluded that although there were clear statements of commitment to racial equality within regeneration at local, regional and national level, this did not necessarily translate into practice (28). For example, the use of the Race Equality Impact Assessment (REIA) as part of the regeneration process was found to be limited and even where outcomes were gathered, two-thirds of authorities did not use the data and those that did, failed to use the data to inform policy (28). The report identified recommendations at every level, criticising authorities' attempts so far to fulfil their duties to racial equality within the regeneration process (28).

Previous Literature Reviews and Rationale for the Current Review

Systematic reviews exploring the relationship between the impacts of housing improvements or regeneration have already been undertaken in several areas, predominantly under the wider umbrella of health rather than mental health. A series of reviews has explored evidence for the health effects of a variety of housing and neighbourhood interventions (29). The intervention studies evaluated in this series include physical changes to the fabric of housing, rehousing to different areas, warmth and energy efficiency, provision of basic facilities and slum improvement or demolition. The frequency of these reviews reflects the policy agenda focus on housing over recent years, and, as such, the number of intervention studies exploring changes in health following housing interventions has been increasing. The most recent in this series of reviews is a Cochrane Collaboration review (29) undertaken to assess the health and social impacts following improvements to the physical fabric of housing. A wide variety of papers were included in that review from any time period, including studies in low and middle-income countries and rehousing from slums. The authors report extreme heterogeneity across the studies in terms of methodology, intervention and context. Despite this, their review suggests that improvements in health, respiratory health and mental health are all possible following warmth and energy efficiency interventions. Those studies examining interventions which

were targeted on inadequate warmth and existing respiratory conditions were more likely to report improvements in health. Evidence of improved health outcomes from neighbourhood interventions which tackled area rather than individual needs were less clear (29). They conclude however that although there were self-reported improvements in physical and mental health, the methodological limitations, small populations and poor quality of identified papers means that good quality evidence remains limited (29). Thomson and Thomas (30) use evidence gathered from their systematic reviews to develop theories of possible pathways between housing improvement and health, which highlight a variety of psychosocial factors. They propose the socioeconomic impacts of housing improvements may facilitate health-promoting behaviours in the longer term, thereby leading to improvements in health. Warmth and energy efficiency for example, may lead to an increase in disposable income leading to a reduction in financial stress and improved wellbeing. Improvements in feelings of control over living conditions and increased satisfaction with the home may lead to improvements in life satisfaction, mental health and wellbeing. Increase in usable space, from moving home, home extension or due to increased warmth may lead to increased privacy, reduction in overcrowding, improved relationships, increased opportunities for study and further improvement in employment opportunities, which can in turn lead to an increased sense of personal control, improvements in quality of life, mental health and wellbeing (30).

It is often through empowerment that individuals strive to alter their circumstances and gain a sense of control of their lives which can lead to increased psychological wellbeing and control (31). For example, a recent examination of empowerment in an urban regeneration context reported evidence of higher mental health and wellbeing associated with higher levels of empowerment (32). The role of community engagement and empowerment for example, have been explored as possible pathways to reducing inequalities and although there is evidence that the impact of community engagement interventions on a variety of health outcomes is positive, a lack of data precluded an analysis of the impact on health inequalities (33). The role of individual and community empowerment and power to exert influence over one's surroundings, by for example joint-decision making, are emphasised as important in reducing health and wellbeing inequalities (16,34). A recent

systematic review focused on empowerment-based interventions, including involvement in decision-making, reported a mixture of positive and adverse effects on individuals who participated (35). Their review covered interventions related to urban design, development and renewal; crime prevention, and; community development; with most included studies rated as low or low to moderate in methodological quality. Nearly half of the papers included in the review relate to urban renewal. The review found evidence of increased empowerment, social activity, connectivity, social cohesion, trust, pride in the neighbourhood and sense of community. They report evidence of how an intervention may lead to improvements in a range of wellbeing factors over time. Their findings also highlight the negative impacts of intervention participation, including increased tension and stress, conflict between community groups, disappointment and a lack of perceived influence. Similar themes around adverse effects were reported in a number of studies and the authors note that these adverse effects appear to be associated with poorly designed and implemented interventions and highlight ways in which these adverse effects may be prevented or overcome (35). The authors conclude that their findings are consistent with Whitehead's (36) proposed model which links increase of collective control with better community health and wellbeing.

The nature of individual relationships within the community and different community groups as well as the shared spaces they have around them can influence levels of trust and sense of community. In an examination of efforts to boost social relations within communities, by improving community infrastructure or places and spaces, a systematic review assessed the impact on social relations and community wellbeing (37). The review included a wide range of interventions including community hubs; events; local neighbourhood design; green and blue space; place-making; alternative use of space; urban regeneration, and; community development. The identified studies were of poor or poor to moderate quality. They report moderate evidence that community hubs and blue and green spaces can promote social cohesion, increase social capital, social networks and trust. The review also identified negative impacts such as feeling excluded and potential resolutions, such as considering access for disabled individuals or by ensuring that interventions involve interaction between different groups Interestingly this review highlighted some negative perceptions around

interventions targeted at specific groups, for example walking groups for ethnic minorities or women, and the feeling that they are examples of a lack of cohesion and might reinforce difference (37).

A lack of opportunity to participate reduces the opportunities for increasing one's sense of control and personal empowerment. There are different levels of community participation including information, consultation, joint decision, joint action and independent community initiatives supported by government agencies (38). Ijasen, Ahmed and Oluwumi (39) point out that the current level of participation of BME groups in regeneration is mostly at the "information" level and they identify a number of reasons for this, such as BMEs preference for participating with each other and with other community groups but rarely government agencies and they propose that a lack of trust and a lack of perceived belonging contribute to this. They also highlight the importance of community participation in improving social inclusion and a sense of belonging, thus reducing social exclusion (39). Community participation also has the potential to develop skills within the BME community, which will further enable participation within the community, leading to the generation of initiatives as well as increased confidence in putting these ideas forward to the appropriate government agencies (39). Furthermore, they highlight aspects which can facilitate BME participation, such as the timing of consultation with BME groups and its potential to improve trust, the use of local "champions" made up of individuals or groups who have the potential to make significant contributions to participation and improvements in the community. Training and skills building have the potential to allow local residents to build a sense of ownership of regeneration plans by using local skills. Collaboration with existing BME community groups may also facilitate and promote BME participation, reducing concerns relating to trust, communication and culture (39). This, in particular, may allow those individuals who currently feel unable to participate, due to their immigration status for example, a credible and trustworthy avenue to participation and have their voices heard (39). Bignall (40) also highlights the continued lack of effort to involve BME groups in participation in housing in their capacity as tenants, despite the growing emphasis on tenant participation schemes within policy reports. A lack of involvement of these groups in housing means that their needs and concerns may not be addressed, therefore important opportunities to increase individual and

community empowerment are missed. Although there is potential for community engagement to have positive impacts on the individual and the wider community, a systematic review exploring the experience of community engagement on the individual, also identify negative, unintended consequences of engagement (41). The review found that individuals involved in community engagement initiatives report perceived benefits of engagement, including physical and psychological health, self-esteem, personal empowerment and social relationships. The negative consequences identified by Attree et al. (41) include reports of exhaustion and stress, reports of a drain on physical and financial resources, as well as reports of fatigue from successive waves of initiatives in their area.

In a systematic review focused on different types of interventions designed to prevent homelessness or address unstable housing and the impact on individual and community wellbeing, evidence on housing interventions for adults who are vulnerable to exclusion or discrimination in relation to housing and its relationship to wellbeing are explored (42). Of the main forms of intervention examined, there was a significant difference in the number of days an individual was stably housed, with the Housing First group reporting the highest. The review highlights that the fidelity with which the Housing First approach is implemented has differing effects on outcomes, with high fidelity associated with better outcomes in relation to housing stability and better community functioning compared with treatment as usual. One Canadian study focused on ethnic minority participants and employed an adapted version of Housing First with the inclusion of anti-racism and anti-oppression practices and found a significant difference in the number of days of stable housing, with the Housing first group reporting the highest (42).

A recent rapid review of the literature relating to the impact of regeneration on health (including mental health), health inequalities and their socio-economic determinants has been conducted (43). The review concluded that the quality of available evidence for the impact of regeneration is poor. Furthermore, the review notes that better quality evidence exists for housing-led regeneration programmes involving refurbishment and specific housing improvements, especially in relation to mental health (43). There are some methodological limitations with this most recent review. The review is described as a "structured, rapid review" and although a structured approach

has been used, this rapid review lacks the qualities of a more rigorous systematic review. For example, with searches undertaken using limited databases and limited search terms, with neither searches nor identified papers peer reviewed (43).

Importantly, none of the above reviews explore the impact of urban regeneration on BME groups. The current review will address some of the limitations identified in the McCartney et al. (43) rapid review by extending the databases searched, the search terms used and the involvement of multiple reviewers. Furthermore, to address the lack of reviews considering the intersectionality between race, inequality in mental health and urban regeneration, it is important to provide a review focused on BME mental health. While it is recognised that this review spans disciplines, psychologists are well placed to explore this area.

Objectives of the Current Review

The aim of this review is to synthesise studies which explore BME mental health outcomes following urban regeneration and pose the following questions: Does urban regeneration lead to improved mental health in BME populations? What is the methodological quality of the research conducted in this area to date? How might the research conducted to date inform future research and policy initiatives?

Methods

Prior to conducting this review, a series of scoping searches were undertaken to assess the viability of exploring this topic and to test the search strategy. Early findings were discussed with supervisors and an expert in the field and it was recommended that the search terms were kept broad to ensure that relevant publications were not overlooked. Furthermore, during scoping searches, databases containing the most relevant literature were identified. The screening process indicated a lack of studies which both collated demographic information on ethnicity and provided an analysis of mental health and wellbeing outcomes based on ethnicity. The screening process also indicated the variability in the use of the terms relating to urban regeneration and the types of interventions described as regeneration. The majority of studies focused on improvements to housing with less focus on area level improvements to the wider urban environment. The adopted search strategy and inclusion criteria were therefore adapted to reflect this.

Search strategy

To explore the review question, a search was carried out using the following method. Publications eligible for inclusion were those which:

i. Evaluated the impact of urban regeneration on mental health outcomes using pre- and post-intervention assessment of mental health or wellbeing for adults (≤18 years).

ii. Were conducted in countries which are part of The Organisation for Economic Co-operation and Development (OECD).

iii. Collected and reported demographic information on ethnicity, citizenship, immigration status or country of birth.

iv. Reported on post-1990 urban regeneration programmes only in order to increase comparability.

v. Were written in English.

Studies were excluded where:

i. Demographic information on ethnicity, citizenship, immigration status or other similar were not collated or reported.

ii. The paper presented a systematic review, study protocol or commentary on urban regeneration.

iii. The paper presented a theoretical evaluation and summary of existing studies of urban regeneration.

The search strategy identified relevant research papers by:

a) Keyword title and abstract searches of electronic databases (Psychinfo; Social Sciences Citation Index; Medline and Medline In-Process).

b) The basic search string was adapted to account for each database as appropriate using the following search string.

(regeneration OR renewal OR rebuild*)

AND (urban OR city OR town OR neighbourhood OR neighborhood OR area)

AND (mental health OR mental illness OR mental disorder* OR psychiatric disorder* OR psychological disorder* OR (wellbeing or well-being or well being) OR depression OR anxiety)

c) Limits: (i) human; (ii) English language, (iii) Peer Reviewed journal.

d) Grey literature and dissertations were excluded from the initial searches due to constraints in time and resources.

e) A secondary review of reference lists from existing systematic reviews was also undertaken to identify further papers for inclusion.

Study selection

To ensure quality and accuracy through the screening process, two reviewers checked results at each stage, and this provided opportunity to discuss aspects of included studies. Citations identified by the search strategy were assessed for inclusion in stages. Reviewer One screened all relevant titles

and abstracts identified via electronic searching against the inclusion criteria and Reviewer Two screened 20% with decisions cross-checked for accuracy. Next, full text copies of potentially relevant studies were obtained and assessed by Reviewer One using the inclusion criteria and this was checked by Reviewer Two. Any disagreements between reviewers were resolved by discussion at each stage.

Data extraction and analysis

For accuracy and quality purposes, Reviewer One recorded detailed information for each article and this was assessed by Reviewer Two. A data extraction form was used to review each article selected for inclusion. This form was used to classify and organise information provided in each article. Data recorded on the form included descriptive information about the population and setting (i.e., location of study, study eligibility criteria, population characteristics), and study design and sample (i.e., study groups, sample sizes, methods).

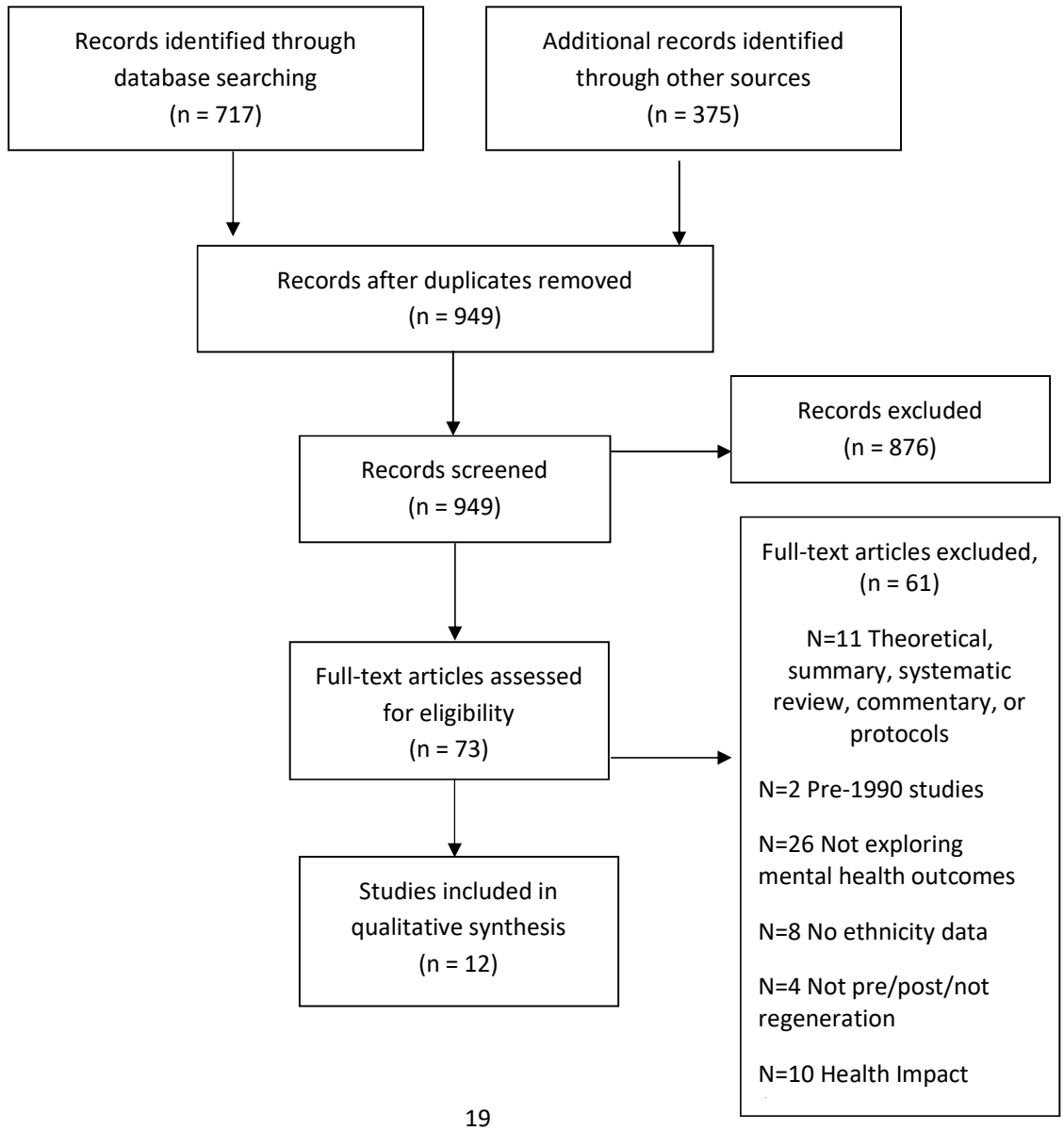
There are a number of tools available for quality assessment and the reviewer considered the Centre for Reviews and Dissemination (2009) guidance for undertaking reviews in healthcare in selecting an appropriate tool (44). The Effective Public Health Practice Project (EPHPP) is considered an appropriate quality review tool for systematic reviews considering quantitative studies by Deeks et al. (45) and is recommended as suitable for reviews considering public health interventions (46). It is argued that, given the growing evidence on the social determinants of health and wellbeing and the 'Health in all Policies' drive, it is appropriate for a wide range of social interventions to be considered as public health interventions, including those relating to housing (47). Each paper was assessed for quality purposes used the EPHPP by Reviewer One and Reviewer Two and results were compared indicating an agreement level of 97%. Differences in ratings were discussed and resolved.

Due to the heterogeneity of the studies identified in the review, in terms of outcome measures used and population samples, a narrative synthesis was undertaken to present and summarise the findings of this review along with consideration of the quality of the included studies.

Results

The electronic searches and reference searches identified 1,092 potentially relevant articles. After removing duplicates and following screening of titles and abstracts, 73 potentially relevant articles were identified, and full text publications obtained (Figure 1). A further review of obtained articles against the inclusion/exclusion criteria led to the exclusion of 60 articles, and 13 articles were subsequently identified as meeting inclusion criteria. A summary of the included studies is shown in Table 1.

Figure 1. Article selection process:



Summary of studies

Two papers report on the New Deal for Communities (NDC) urban regeneration initiatives across 39 NDC areas with each area allocated a budget of approximately £50m (48,49). The NDC involved a variety of interventions including but not limited to refurbishment of poor-quality housing, creation of workspaces for small businesses and drug and alcohol outreach programmes. Neither of these papers report on size of the intervention areas or number of households effected. Stafford, Nazroo, Popay and Whitehead (48) compare outcomes for the intervention group (N=10,390, including 22% South Asian, Black or Other) with a comparator group (N=977, including 17% South Asian, Black or Other) in a two year follow-up. The comparator group is described as matched on deprivation score and local authority. Response rates from baseline were 73% and 72% for intervention and comparator group respectively. Walthery et al. (49) compare outcomes for the intervention group (N=10,638, including 23% South Asian, Black or Other) with a comparator group (N=1,010, including 19% South Asian, Black or Other) in a six-year follow-up. Walthery et al. (49) report a 74% response rate and state that additional interviews were conducted at each wave in order to account for attrition and analyse results for participants who provided data at two different time points.

Ambrose (50) reports on housing improvements which were achieved either by rehousing or improvement of existing accommodations. The response rate for the pre-intervention survey was 90% and of the 525 participants who took part in the first stage, 69% are described as Bangladeshi, 19% White and 6% Black and 6% Other. Criteria for taking part in the post-intervention stage of the survey include households who had lived in improved accommodation for a minimum of one year which restricted the number of participants eligible to take part to 70 households and 77% of those householders agreed to take part. This amounts to approximately 48% response rate when compared to pre-intervention.

The GoWell study areas include 14 deprived neighbourhoods in Glasgow and cover approximately 17,800 dwellings, from which their study was sampled. The three papers reporting on the GoWell study (51–53) provide a description of the type of housing improvements provided during

the intervention and also provide information about the different intervention areas. The samples are described as nested longitudinal and are compiled retrospectively to identify residents who had completed surveys on more than one occasion. Two papers (51,52) report on outcomes for the same sample which includes an intervention group (N=1,334; up to 21% non-British) and control group (N=602, 11% non-British). Egan et al. (53) also report outcomes using a nested longitudinal sample with three groups; intervention group (N=315, including 7.9% non-British), demolition group (N=443, including 40.8% non-British) and comparison group (N=283, including 5.6% non-British).

Jalaludin et al. (54) report on a small area urban renewal programme in South West Sydney, Australia. The intervention area were two streets of established social housing and the intervention consisted of internal and external upgrades to the home as well as social interventions aimed at community engagement, education and employment initiatives and establishing a community meeting place. This small study reports on outcomes for 28 participants, 21% of whom are described as born outside of Australia and 21% described as "Aboriginal". The authors report that 42 households took part at pre-intervention, a 74% response rate, with those eligible to take part at post-intervention reduced to 29 due to people leaving the area and 28 took part at post-intervention (97% response rate) (54).

Two papers report on urban regeneration programmes as part of the Dutch District Approach and the intervention area covered 40 deprived districts with investment over the study period approximately €40m (55,56). Jongeneel-Grimen et al. (55) reports that details of interventions undertaken were not recorded in four districts. An inventory of all interventions indicated there were 18 types of intervention and the remaining 36 districts were grouped to least and most intensive in terms of level of intervention received. Both studies draw on national data collected at six monthly intervals from but over different periods, Jongeneel-Grimen et al. (55) report on data gathered between 2004 and 2011 and Ruijsbroek et al. (56) 2003 and 2014. Neither of these papers report on size of the intervention areas or number of households effected. Jongeneel-Grimen et al. (55) compare the intervention group (1,445, including 35.3% non-Dutch, non-Western) with three comparator groups, two are matched with the intervention area on "liveability" (N=1,574 and

N=6,163, 16% and 11% non-Dutch, non-Western respectively) and the third comparison group is data taken from the rest of the Netherlands (55). Ruijsbroek et al. (56) compares intervention group (N=1,864, includes 31% of participants described as "non-Dutch, non-Western") with one comparison group (N=4,339, 16% non-Dutch, non-Western). Both papers report a varying response rate for the different stages of interview ranging from 55% to 80%.(55,56).

One paper reports on a Single Regeneration Budget area regeneration programme in the North West of England (57). Huxley et al. (57) report that over £2m had been invested in the intervention area over the study period, with additional complementary developments funded by private sector initiatives. Although they name the area undergoing regeneration, they do not quantify the size or number of households effected. The sample was selected randomly from the electoral register with a 17% response rate to the initial postal survey and the intervention group was matched with neighbouring wards matched using Index of Deprivation and local statistics. At follow-up, 1,344 participants responded, with 522 participants moving out of the area and a further 35% of those remaining were lost to follow-up. The number of participants described as 'non-white' in the intervention and control group are 2% and 6% respectively. Although the study states that demographic information collected included ethnicity, this information is not described in the results. Describing analysis of results, the authors state that 'white ethnicity' was considered among other independent variables.

Two papers report on outcomes relating to a Scottish urban renewal project, SHARP and describe interventions across Scotland, including rural areas (58,59) . The main intervention under investigation by the SHARP program was rehousing to a newly built socially rented home. Petticrew et al. (59) compares outcomes for the intervention group (N=339) with a comparator group (N=392) and Kearns at al compare intervention group (N=333) with a comparator group (N=389). The authors describe non-white ethnic populations as approximately 2%, reflecting the national average together with a 46% response rate.

What is the methodological quality of the research conducted in this area to date?

One aim of this study was to evaluate the methodological quality of the research conducted in this area and this was assessed using the EPHPP, with each paper given component and global ratings of weak, moderate or strong. Following the quality assessment, all 12 papers were assessed as weak quality (see Table 1). The global quality rating is assessed as weak where two or more individual component ratings are assessed as weak in relation to selection bias, study design, confounders, blinding, data collection methods and withdrawals/dropouts. A full breakdown of the quality ratings and component ratings for each paper are contained in Appendix B.

Due to the nature of the interventions, often being area wide, many of the studies were observational in nature, with several studies gathering data retrospectively, meaning that aspects such as randomisation to intervention or control group and blinding of researchers and participants would not have been possible. There are, therefore, areas assessed within the EPHPP quality assessment tool where it would never be possible to achieve a 'strong' rating for such studies.

The 12 identified studies differ in several ways, limiting comparability. For example, the overall sample sizes and the percentage of BME participants in those samples, varied greatly across the 12 identified papers. Across the identified studies, participant numbers included in each intervention group ranged from 28 to 10,638 and percentage of BME participants ranged from 2% to 88%. In addition, the number of BME participants may have been understated with the use of citizenship to define participant groups. None of the studies describe the purpose of collecting demographic information on ethnicity or citizenship or provide information on how they intend to use this information. Information on the reasons behind the choice of categorisation of such information is also absent from the studies.

Not all studies reported or confirmed receipt of intervention and whether these were comparable across participant groups. Ten papers included a control group and report differing methods of matching the control with intervention group (48,49,51–53,55–59). For example, intervention and control areas were matched in level of deprivation, measured using the Index of Multiple Deprivation or other similar deprivation scoring system (57). Alternatively participants from

the same neighbourhoods were allocated to the control or intervention group based on whether they had received or participated in an intervention, thereby increasing comparability (51–53). Huxley et al. (57) report that their control group was taken from matched neighbouring wards and in the post-intervention survey, there was no difference in the number of participants reporting a change in their street in either intervention or control area, suggesting that changes as a result of urban regeneration were seen across both intervention and control areas. The level of detail by way of the description of the intervention and comparator areas varies significantly across the identified papers, and while some studies report their efforts to match on deprivation level, important detail on density, urbanity and ethnic composition are not reported. Included studies do not report on whether the quality of housing was assessed using objective methods of measurement, this is particularly important when comparing intervention with control groups. In addition, important demographic differences between intervention and control groups such as age, gender and ethnicity are reported by several studies. It is unclear from the identified studies how geographically close the control and intervention groups were and whether there was a risk of contamination of interventions across the control and intervention areas. All of the identified studies report on housing interventions in areas of social housing or a mixture of privately owned and social housing.

The number of data collection waves, length of intervention and follow-up period following the completion of interventions also varied greatly. The two Dutch studies for example analyse data collected at 6-monthly intervals over several years and in their study. Data was gathered by face to face interview, postal or other survey method, for example one study involved before and after data using face to face interviews, with the 'before' interviews taking place over several visits, spanning a five-month period and the 'after' interview taking place approximately one year after completion of intervention over 'three or so' visits over a period of 2-3 months (50). Data for a larger study were collected via face to face interviews at four data collection waves over a six year period from 2002 to 2008, assessing an intervention period which ran from 1999 to 2011 (48,49).

All but one of the identified papers used validated mental health measures, with Ambrose (50) gathering data on self-reported illness episodes and illness days associated with stress and depression.

The Short Form-36 (SF-36) (60) and the later shortened version, Short Form-12 (SF-12) (61) are general health questionnaires which include questions on wellbeing, and both have been shown to be valid in detecting active and recent depressive episodes (62,63). Three studies (58,59,64) used the SF-36 (60) and three studies (51–53) used the SF-12 (61). Four studies used the Mental Health Inventory-5 (MHI-5) (65), which is derived from the SF-36 (48,49,55,56) and two studies (54,57) used the General Health Questionnaire-12 (GHQ-12) (66) and Kessler Psychological Distress Scale (KPDS) (67) respectively.

Eight of the identified papers also assess a variety of additional outcomes relating to urban regeneration, including levels of satisfaction with the home and neighbourhood and changes in health behaviours (48–50,54,56–59). Some of the measures used were extensive, including a number of questions concerning participants perceptions of housing and area improvements (54), while others used single questions to assess self-rated health and quality of life (49). Minimal information is reported the reliability and validity of measures used in relation to these additional measures.

Only one paper describe methods of enhancing and supporting participation in their study for individuals who required support in another language (50). In preparation of undertaking participant interviews, the research team underwent two days of intensive training, which included cultural awareness and due to high levels of Bangladeshi participants, each interviewing pair included a Sylheti speaker (50). One paper actively excludes participation by individuals not able to complete the study questionnaires in English (54). While those papers reporting on the GoWell study acknowledges that participants described as non-British citizens were recent inpatriates, asylum seekers and refugees, they do not mention if language presented a barrier to participating in the study or state any adaptations made to overcome barriers to participation (51–53).

Does urban regeneration lead to improved mental health in BME populations?

Three of the identified papers collected demographic information in a way that allowed identification of ethnicity, with two of these reporting the use of 2001 English Census question for the collection of demographic information (48–50). These same three papers also indicate analysis of results by ethnicity but provide varying levels of detail on these results. Three papers reporting on the

GoWell project categorise participants based on UK and non-UK citizenship (51–53), and one of these papers provides analysis of results by citizenship (52). Curl and Kearns (51) and Curl et al. (52) use the same participants in their study's, with one study building on the other. Egan et al. (53) does not provide analysis based on citizenship, however does report that the 'demolition group' consists of 40% non-British citizens. Of the remaining six papers, two indicate that ethnicity or country of birth was treated as a confounder and controlled or adjusted for in their analyses (55,57) and four do not comment on ethnicity in their analyses of results (54,56,58,59). A summary of the outcomes is provided below with studies which both collate information on ethnicity and either provide analysis of results by ethnicity or where the BME participant numbers are high (N=3). The next group of papers considered are those which collate information by citizenship and either provide analysis of results by citizenship or where the BME participant numbers are high (N=3). The remaining papers (N=6) are summarised, with two stating that citizenship or ethnicity has been accounted for in their analysis of results and four who make no comment concerning ethnicity or citizenship.

Mental health outcomes – Ethnicity (N=3)

In a two-year follow-up study (intervention group N=10,390, 22% BME; comparator group N=977, 17% BME) Stafford et al. (48) found improvements in mental health with no significant difference in the extent of improvements between intervention and comparison groups. However, in relation to Black participants they report smaller improvements in psychological wellbeing compared with White participants and an increased likelihood of quitting smoking in south Asian participants (48). Walthery et al. (49) builds on these findings by incorporating four data collection waves which took place over a six-year period (intervention group N=10,638, 23% BME; comparator group N=1,010, 19% BME). The study found that participants with the worst mental health at baseline were most likely to show improvements over the time period of the study and this was the case for female participants. Non-white participants reported better mental health at baseline, this suggests that any reported improvements for this group may have been minimal. Overall, the authors conclude that participants from regeneration areas did not experience a significant worsening or improvement of their mental health (49).

A smaller study with an intervention group only and including a high percentage of BME participants (pre-intervention N=525, 69% Bangladeshi, total of 81% BME; post-intervention N=227, 78% Bangladeshi, total of 88% BME) report a post-intervention increase in the number of self-reported episodes of self-defined depression and stress, however the authors report a decrease in the length of reported illness episodes (50). The authors suggest that there are low levels of reporting of stress and anxiety by the Bangladeshi participants and propose that the impact of stress and depression may have been minimised or stated as physical symptoms (50).

Mental health outcomes – British citizenship (N=3)

Curl et al. (52) explore the relationship between different types of housing intervention, health and mental health and report small improvements in mental health across the time of the study (intervention N=1,334, 21% non-British; control group N=602, 11% non-British). Curl et al.'s (52) reports that non-British participants were more likely to live in a demolition area and to receive new central heating and secure front doors their findings indicate that non-British individuals had higher post-intervention mental health scores compared with other participants. Curl et al. (52) explored the relationship between how long an intervention had been in place and changes in mental and physical health impact of time since the intervention on mental and physical health. They report that new kitchens and bathrooms had the strongest positive association with mental health but only more than a year following intervention. They also report that new front doors had a positive association with mental health within the first year following intervention, fabric works at years 1 – 2 after the intervention and central heating at 3 – 5 years after the intervention. Curl and Kearns (51), who explore the same research data as Curl et al. (52) with a focus on recovery and onset of health conditions, report the strongest association between mental health recovery and fabric works. They do not, however, provide separate analysis for non-British participants but state that they control for citizenship (51). Fabric works are described as including external works such as roofing, cladding and windows, and improvement to common areas such as communal entry systems and doors, decorating, lighting and lift replacement (52).

Egan et al. (53) compared outcomes for two intervention groups and a control group. The main intervention group are participants in areas undergoing extensive internal and external housing improvements; the second group are participants in areas undergoing demolition, where one third of residents who remained living in the demolition area received limited housing interventions, most commonly secure front doors and central heating (intervention N=315, 8% non-British; demolition N=443, 41% non-British; control N=283, 5% non-British). The control group was taken from those living in the main intervention group area and who were either on a waiting list for extensive improvements or failed to qualify for improvements (53). The study found a small decrease in mean SF-12 (61) scores from pre-to post intervention for the control group, a slight but non-significant improvement in SF-12 scores for the demolition group and, what the authors describe as a 'borderline" significant improvement for the housing intervention group. However, they note the wide confidence interval (53).

Mental health outcomes (N=6)

Huxley (57) reports on both outcomes and predictors of mental health following an SRB project which involved area level and housing improvements (entire sample, N=1,344, 2% non-white in intervention group; 6% in control group) . The study found no evidence of differential improvement in mental health as assessed by the GHQ-12 (66) in the intervention versus the comparator group and higher numbers of General Practitioner (GP) visits by the intervention group.

One study set in the Netherlands reports a lower prevalence of "fair and good" mental health as assessed by the MHI-5 (65) in intervention areas compared with the comparison group and report similar prevalence rates post-intervention (intervention N=1,864, 30% non-Dutch, non-western; control N=4,339, 16% non-Dutch, non-western) (47,).

A study based in Australia, evaluated the health effects following urban renewal and involved internal and external housing improvements and social interventions aimed at enhancing community engagement, with 21% of participants described as "non-Australian" (54). They find a reduction in individuals reporting high or very high psychological distress as assessed by the KPDS (67) following

the intervention, however they note that the change is non-significant (54). This study does not comment on ethnicity or citizenship in their results.

Petticrew et al. (59) reports on an SRB in Scotland where 2% of participants are reported to be from non-white ethnic groups, which they state broadly reflects the ethnic population of Scotland. This study reports on outcomes in relation to social housing following the move to a newly built home after one year. The study does not comment on ethnicity in their results and report little change in SF-36 (60) mental health scores for the intervention group over the time of the study, however it does report a significant increase in vitality scores, with low scores indicating fatigue or exhaustion. A further paper also reporting on the same SRB in Scotland explores outcome data two years after intervention and again does not comment on ethnicity in their results (58). It similarly reports little change in mean scores across all dimensions of the SF-36 (58,60). However, when examined by household type, they report a positive mean change in SF-36 (60) scores for families with dependent children and a negative mean change for older adults and households with adults and no children a more mixed picture of mean change across the four dimensions of the SF-36 (58,60). Within family households, gains in space were associated with positive mean change across all four dimensions of the SF-36 (60) and gains in privacy and change of location were associated with positive changes in three dimensions of SF-36. Controlling for other residential changes, positive change in mental health was associated with change of location (58).

The second Dutch study (56), drawing from the same data sources as Jongeneel-Grimen et al. (55) but for 2003 to 2014, reports a slight decline in mental health. This study describes 35% of the intervention participants as non-Dutch non-Western or non-Dutch origin unknown and 17% of the comparator group. Findings from the study indicate a slight but non-significant reduction in the percentage of participants reporting fair or good mental health. However, analysis by gender indicates an increase in women in the intervention group reporting fair or good mental health and a reduction for men, neither were statistically significant (56).

Based on the identified papers, there is extremely limited evidence to fully consider the impact of urban regeneration on the mental health of BME groups and the quality of evidence is poor.

Several studies chose to categorise participants by citizenship, a category which would subsume ethnic minorities who are citizens.

Additional outcomes following housing-based urban regeneration

Five papers extend their evaluation to explore participant's perceptions of the social and physical aspects of the environment post-intervention, including levels of satisfaction with the home and neighbourhood (48,50,54,58,59). Two papers explore changes in health behaviours including physical activity and smoking (48,56), while three papers consider the types of intervention associated with changes in mental and physical health (51–53). Those six papers which provide detail relating to ethnicity or citizenship are discussed further (48–53).

Both Egan et al. (53) and Curl et al. (52) report a strong association between improvements in mental health and secure doors in the first year following intervention, suggesting a reduced fear of burglary or intrusion and heightened sense of security. Those receiving new front doors were most likely to be non-British and living in a demolition area (52,53). Consistent with this, two studies report improvements in participants perceptions of safety within the home. Stafford et al. (48) provide analysis of results by ethnicity, which indicate a reduction in fear of property crime for South Asians in the intervention area and a slight increase in the comparator group. For Black participants fear of property crime increased slightly in the intervention group and decreased slightly in the comparator group. Two papers also report improvements in participant's perception of crime and safety in the local area (48,50). Stafford et al. (48) report that fear of crime against the person decreased for South Asian participants in the intervention group and increasing slightly in the comparator group. For Black participants in the intervention group, fear of crime decreased at a similar level to South Asian participants, however, in the comparator group, a greater decrease in fear of crime was reported by Black participants. Ambrose (50) reports an increase in feelings of safety on the estate and in the streets nearby. Furthermore, they report a reduction in participants rating local criminal activity as "very" or "fairly" serious. There were further reports of improved perception of the social quality of the local area, for example in one study participants reported an increased sense of belonging to the local community and an increase in informal networks (50).

Inside the home, mental health benefits were reported by Curl et al. (52) to be associated with improvements in fabric works 1 – 2 years following intervention and as strongly associated with central heating between 3 to 5 years following intervention (52). Curl et al. (52) also state that those who received central heating were most likely to be non-British and live in a demolition area. One study with a four-year follow-up, of housing improvement and moving to new housing, found a reduction in problems with damp and difficulties with cold (50). These problems were not eradicated however, and one third of participants continued to report these problems following intervention (50).

Curl et al. (52) reported a strong association between improved mental health and the installation of new kitchens and bathrooms after the first year following intervention. However, non-White participants were least likely to be in receipt of new kitchens and bathrooms. Interestingly, the authors note that this was an area where participants were involved in making choices about colour and layout for instance, which may have led to increased feelings of choice and control. One study reported an increase in participants expressing satisfaction with their home following improvements to the home or moving to a new home from 34% to 76% and with the estate from 59% to 90% (50). This paper also reported an increase in participants access to key household equipment such as washing machines, from 52% to 78% and a significant increase for drying facilities from 22% to 90% and a decrease in participants reporting problems with their home from 73% to 40%.

Only one paper reported on aspects relating to relating to community connectedness. Ambrose (50) found an increase in participants reporting that they know the people living close to them “very well” from 34% to 64%. There were also increases in participants reporting that they “very much” or “to some extent” felt that they belonged to their nearby community from 45% to 58% and 17% to 34% respectively. In a two-year follow-up, Stafford et al. (48) report a significant increase in income in both the intervention and control group, however women saw smaller increases in income compared with men and were less likely to find work. No significant changes in relation to BME groups in relation to income were reported, however the reported change scores indicate a reduction in income for Black and South Asian participants (48). Comparison at different socioeconomic levels revealed that with increasing education, there was a steady increase in the

likelihood of taking part in training, education and finding work and of giving up smoking in the intervention area (48).

Exploring health behaviours, Stafford et al. (48) report an increased likelihood of quitting smoking in south Asian participants (48). There were also no significant changes reported in physical activity levels in the intervention areas (48).

Table 1: Summary information of included studies

Authors and Year	Type of regeneration	Study Design	Participant numbers	Ethnicity information reported in demographics? Categorisation used	Follow-up	Measures used	Results analysed or reported by ethnicity	Relevant Findings	EPHPP Global Rating
Ambrose (2000)	Single Regeneration Budget (SRB)	Pre and post with control group – unmatched sample	Pre – 525 Bangladeshi 69% White 18% Black 6% Other 5% Post – 227 Bangladeshi 78% White 12% Black 8% Other 2%	Yes – participant characteristic described and included Bangladeshi, White, Black and Other	4 years	Illness days and illness episodes	Yes – analysis on different ethnicities.	Non-significant increase in episodes of self-reported stress and depression. Significant decrease in number of self-reported illness days.	Weak
Curl & Kearns (2015)	GoWell – Glasgow Housing Improvements	Repeated cross-sectional with nested longitudinal sample. Pre and post with no control group	Intervention = 1334 21% non-British Control = 602 11.4% non-British	Information gathered on citizenship and categorised as British and non-British	2-5 years	SF-12v2, Mental Health Component MCS-12	Citizenship is controlled for in the analysis of results	Fabric works significantly associated with recovery from mental health conditions Greater proportion of ill health reported post intervention	Weak

Curl et al. (2015b)	GoWell – Glasgow Housing Improvements	Repeated cross-sectional with nested longitudinal sample. Pre and post with control group from waiting list	Intervention = 1334 British 79% Non-British 21% Control = 602 British 89% Non-British 11%	Information gathered on citizenship and categorised as British and non-British	<1 to 5 years	SF-12v2, Mental Health Component MCS-12	Yes by citizenship	Overall sample showed improvement in mental health from T1 to T2 Non-British had higher scores than others at T2	Weak
Egan et al. (2013)	GoWell – Glasgow Housing Improvements	Repeated cross-sectional with nested longitudinal sample. Pre and post with control group from waiting list	Group 1 - Demolition area = 443 British 60% Non-British 40% Group 2 – Intervention area = 315 British 92% Non-British 8% Control group = 283 British 95% Non-British 5%	Information gathered on country of birth: Born in the UK, not born in the UK or immigration status	2 years	SF-12v2, Mental Health Component MCS-12	No but approximately 40% of participants in demolition group were born outside of the UK	Mean mental health score for the demolition group and intervention group improved at wave 2 and worsened for the control group The improvement in the intervention group was significant compared with controls	Weak
Huxley et al. (2004)	Single Regeneration Budget Area – South Manchester	Intervention and control group, pre and post	1344 Intervention 2% non-white and Control Group 6% non-white	Sample data was compared to census data to establish representat	22 months	GHQ-12	Authors state that other independent variables, including white ethnicity are	Mean mental health score indicated a small and non-significant improvement for both intervention	Weak

				iveness of sample – including ethnicity			considered in analysis	and control groups. However health satisfaction decreased slightly in the intervention group relative to the controls	
Kearns et al. (2011)	SHARP Study - Scotland	Two groups, pre and post	Intervention group = 339 Control group = 392 2% non-white	Ethnicity is referred to but demographic data not provided.	1 year	SF-36	Not commented on in results	No significant change in mean mental health score but statistically significant increase in vitality score.	Weak
Jalaludin et al. (2012)	Small area urban renewal program – south-west Sydney	One group, pre and post	Intervention group – 28 22 born in Australia 6 born outside of Australia 6 Aboriginality	Country of birth, Australia and Other	2.5 years Approximately 8 months after completion of works	Kessler Psychological Distress Scale K10	Not commented on in results	Fewer households reported no mental health problems at follow-up but non-significant	Weak
Jongeneel-Grimen et al. (2016)	District Approach Urban Renewal - Netherlands	Repeated cross-sectional Three control groups matched on propensity score and data from the rest of Netherlands	Netherlands = 44795 5%non-Dutch, non-western Intervention group = 1445 26% non-Dutch, non-western Control group = 6163 11%	Ethnicity based on Dutch, non-Dutch western, non-Dutch, non-western, non-Dutch origin unknown	7 years – 6 month intervals	Mental Health Inventory -5	Authors state that a range of individual level factors, including ethnicity, were used to control for potential confounding	Overall stable trend in the intervention period for the intervention group, slight and non-significant improvement for women and slight non-significant deterioration for men	Weak

			non-Dutch, non-western						
Petticrew et al. (2009)	SHARP Study - Scotland	Two groups, pre and post	Intervention group = 339 Control group = 392 2% non-white	Ethnicity is referred to but demographic data not provided.	1 year	SF-36	Not commented on in results	No significant change in mean mental health score but statistically significant increase in vitality score.	Weak
Ruijsbroek et al. (2017)	District Approach Urban Renewal - Netherlands	Repeated cross-sectional Control groups matched on propensity score	Intervention group = 1864 30% non-Dutch, non-western Control group = 4339 15% non-Dutch, non-western	Ethnicity based on Dutch, non-Dutch western, non-Dutch, non-western, non-Dutch origin unknown	11 years – 6-month intervals	Mental Health Inventory -5	Not commented on in results	No significant impact of urban regeneration on mental health	Weak
Stafford et al. (2008)	New Deal for Communities	Pre and post with control group matched for deprivation levels.	Intervention group = 10,390 22% S Asian, Black and other Control group = 977 17% S Asian, Black and other	Yes - Ethnicity broken down into: White, South Asian, Black and Other	2 years	Mental Health Inventory -5	Yes - Analysis on different ethnicities.	Non-significant results; Black residents show smaller improvements in psychological well-being compared with white residents, and south Asian residents were more likely to quit smoking.	Weak

								Overall improvements for the NDC area but similar to comparator group.	
Walthery et al. (2015)	New Deal for Communities	Pre and post study with control group matched for deprivation levels.	Intervention group = 10,638 23% S Asian, Black and other Control group = 1010 19% S Asian, Black and other	Self-defined ethnicity (using the 2001 English Census question)	6 years	Mental Health Inventory -5	Examines ethnicity but collapses the analysis into white and non-white	No significant changes over time. After adjusting for demographics, at baseline, non-white respondents enjoyed better mental health than white respondents	Weak

Discussion

This systematic review set out to answer the following three questions: What is the methodological quality of the research conducted in this area to date? Does urban regeneration lead to improved mental health in BME populations? How might the research conducted to date inform future research and policy initiatives? These questions will be considered in turn:

What is the methodological quality of the research conducted in this area to date?

The quality of evidence and findings within this review are consistent with earlier reports, the 12 papers were all assessed as weak in quality as assessed using the EPHPP and clear conclusions could be not be drawn in relation to reported outcomes due to the differences in methods employed (43,68,69). Previous researchers have noted the limited data available from studies exploring the relationship between urban regeneration and mental health; this seems especially true when exploring the data in relation to BME groups.

The collection of demographic information across the 12 papers was highly variable with no clear statements on the decision-making process for the categories used to describe participants or the purpose for the collection of such information, thus limiting the opportunity to fully explore differences by ethnicity in the analysis of results. Some papers grouped participants together as 'non-White' or 'non-British citizen' which may conceal important differences in outcomes already indicated in evidence of prevalence rates of depression by ethnic group. Furthermore, the 'non-British citizen' groups may potentially have included White participants, which may have impacted on results. This is particularly important when you consider that women identified as Black or Black British report the highest prevalence rates of CMDs, while women identified as White Other report lowest prevalence rates (2). There is a lack of authors reporting any considerations or adaptations they may have made in relation to cultural differences in, for example, the understanding of concepts such as depression or the validity of outcome measures when used with different cultures or ethnic groups, which may have led to an underreporting of mental health difficulties. The potential for underreporting mental health difficulties due to culture or stigma is highlighted by Ambrose (50) who

concludes that participants were more likely to report physical health than mental health difficulties and suggested that the methodology used i.e. interview, may have contributed to underreporting. One study actively excludes individuals who are unable to complete questionnaires in English from participating in their study (54). Studies also included assessment of additional outcomes including perceptions of safety and satisfaction with improvements to home and neighbourhood, using a variety of measures and there was a lack of reporting on the reliability and validity of measures used (48–50,54,56–59). None of these papers include measures which might capture important nuances in individual perceptions based on race and discrimination and nor do they report that they gave such matters consideration. Questions concerning safety for example, could be adapted to explore the reasons which might lead individuals to feel safe or unsafe in their estate or nearby area. Similarly, the use of qualitative approaches might allow for a richer understanding of individual perceptions of safety and differences by ethnicity. Several studies included relocation to new accommodation as an aspect of intervention and although Huxley et al. (57) for example explores how new accommodation may have differed from the old, for example moving from a flat to a home with a private entrance and garden, other important aspects remain unclear, such as the distance moved and number of community connections or access to amenities were lost or retained. This may be particularly important to certain BME groups whose links to the nearby community in terms of language and culture may increase their sense of belonging and strengthen their links to the community. BME groups may prioritise access to community links when they choose areas to live, therefore relocation may have a detrimental effect on these individuals, particularly if for example they perceive the new living place as lacking important cultural amenities, as isolating or discriminatory.

None of the identified papers indicate whether a baseline objective measure of housing conditions prior to intervention was employed, however several papers do consider participants perceptions of problems with their home and the local area at baseline and consider participants satisfaction with their home following intervention (48,50,54,58,59). The lack of information on baseline housing conditions for control groups is also significant, as it reduces comparability of intervention and control groups. As BME households are more likely to experience poor quality

housing and overcrowding, assessment of housing conditions is essential to ascertain both the existing housing inadequacies and extent of improvement. A further, important limitation in the comparability of control with intervention groups is the lack of randomisation to each group. The papers are observational in nature and there was limited or little involvement of the research teams in the programme of interventions. In order to overcome this, one research team exploring the GoWell programme took their control group from individuals either waiting to receive an intervention or who were not eligible to participate (51–53). The lack of information on reasons why individuals may not be eligible to participate however again raises the question of the quality of these people's homes, for example were they in a property or area considered of good quality? Furthermore, there is a lack of information provided in relation to interventions received and assessment of the quality of those interventions. This highlights a wider problem with the identified papers and the intervention studies they report on. For example, some of the urban regeneration programs involved a variety of projects focused on key outcomes relating to health, unemployment, education, crime and the physical environment, in addition to addressing poor-quality housing (48,49). These papers do not report on how many, if any, participants were impacted by these wider project areas. There is potential contamination across intervention and non-intervention areas, particularly with area wide urban regeneration, for example, following intervention, Huxley et al. (57) report a similar proportion of residents in the intervention and control area reporting changes in their street.

Low response rates and participants lost to follow up was a concern for all the studies. The timing and number of data collection points varied in the identified papers and may have impacted on study findings, with shorter time frames possibly insufficient to ascertain the extent of the impact of interventions. However, studies with longer time frames for post-intervention data collection were also impacted by participants lost to follow up. Furthermore, as Curl et al.'s (52) findings indicating different interventions associated with improvements in mental health at different follow-up points, suggests the value of using more than simple pre and post data collection methods. In addition, this may allow more analysis of the potential disruptive aspects of regeneration such as demolition and clearance.

The identified papers came from three countries and the experiences of BME groups is likely to differ. The study from Australia for example, includes indigenous people and their experiences are likely to be different to BME populations in the UK and Dutch studies, who are more likely to be first- or second-generation inpatriates.

Does urban regeneration lead to improved mental health in BME populations?

The review identified 12 papers which explored changes in mental health following urban regeneration programs and found limited evidence of improvements in mental and insufficient analysis of outcomes relating to BME groups to fully address this question. Poor methodological quality of the identified papers further limits the conclusions that can be drawn as well as the generalisability of findings to the wider population.

Although evidence relating to the impact of urban regeneration on mental health in the BME population is limited, in relation to England and Scotland, six studies support existing evidence of the over-representation of minority and BME households living in deprived neighbourhoods (48–53). Ambrose (50) also adds to existing evidence of the poor-quality housing experiences of Bangladeshi groups.

Previous systematic reviews have found the strongest evidence for improvements to mental health in relation to warmth and energy interventions and suggest that such interventions can lead to a reduction in fuel costs, thereby reducing worry and stress (29,30). In a US study, including participants from Black or Hispanic backgrounds, experiences of energy security and housing conditions were associated with stress (70). After housing costs, participants reported fuel costs as their next highest expense. Participants who were struggling to pay their bills reported high levels of worry and stress, and poor housing conditions led to the use of secondary heating equipment resulting in increased fuel bills, thus exacerbating their problems (70). One study included in this review, found two-thirds of households reporting problems with damp and less than one-third of participants reporting their home was sufficiently warm (50). Although participants reported improvements in these areas following the intervention, one-third of participants continued to report problems with

damp and warmth, even for participants who moved to a new home (50). They also found an increase in households reporting the use of electric fan heaters following the intervention and the authors comment on the high cost of running such equipment and the likelihood of increased electricity bills as a result. The study does not, however, comment on affordability and the one year between the completion of intervention and follow-up may potentially have been insufficient for participants to experience longer-term gains which may have resulted from the intervention, for example the impact of improved heating and reduction of damp on warmth and energy efficiency and fuel costs. In addition, a high percentage of participants (40%) continued to report outstanding repairs at follow-up (50). In one study, it was reported that non-British citizens were most likely to live in demolition areas and receive new central heating and central heating was found to be associated with improvements in mental health at three to five years following intervention (51–53). The authors suggest that the delay in the improvement in mental health following installation of central heating may result from the uncertainty and inconvenience and disruption caused by the process of this intervention. They also suggest that this may also reflect longer-term gains as a result of both central heating and fabric works which may increase warmth efficiency. Central heating and other fabric works may also contribute to reductions in problems with damp and lead to increased usability of rooms. However, most non-British participants lived in demolition areas, where fabric works were not carried out.

There are aspects of poor housing which can lead to poor health which can also influence mental health and wellbeing. Damp for example can lead to respiratory health conditions and chronic stress associated with chronic heart disease (CHD). In the UK, higher rates of CHD are found in individuals from a South Asian background compared with the rest of the population (64). While Egan et al. (53) report a steady decline in physical health across intervention and control groups, Ambrose (50) reported improvements in physical health indicated by a reduction in self-reported illness days. Stafford et al. (48) found no significant changes in self-reported health, physical activity following the intervention and compared with the control group. They do, however, report a significant increase in the likelihood of South Asian participants to give up smoking.

Within certain ethnic groups, inter-generational living is common, and may add to the likelihood of those groups living in crowded conditions (19). Poverty and limited housing and area options, discrimination or fear of racial harassment all may exacerbate this problem (71). Furthermore, as BME groups are more likely to live in poor housing, there is a higher likelihood those problems include damp, thus potentially limiting usable space. Not only are BME households more likely to live in overcrowded conditions, it is suggested that "hidden" homelessness also contributes to overcrowding in BME households (19,26). The increase of usable space as a result of moving to a new home or improvements to heating and a reduction in damp problems, may alleviate crowded conditions and reduce stress (30). Available and usable space may also increase opportunities for privacy and study, leading to improvement in relationships and increased personal control (30). Ambrose (50) reports on post-intervention improvements in room densities, however, following the intervention, two-thirds of Bangladeshi households continued to live at a higher than one person per habitable room density.

A high proportion of non-UK citizens were reported as living in demolition areas in the GoWell studies and were most likely to receive new front doors (51–53). On further analysis of the data, a strong association was found between improvements in mental health and secure doors in the first year following the intervention and not thereafter (52). The researchers suggest that new doors may provide an immediate perception of increased safety in deprived areas where there are problems with crime and anti-social behaviour and thus lead to a reduction in anxiety relating to fear of crime (52). This effect was found across the demolition and housing intervention groups and there may be different reasons for this. Areas undergoing demolition and clearance may raise additional concerns relating to safety for remaining residents and new doors may be responsible for the findings relating to improved mental health, rather than the hypothesised deterioration.

There were also reported improvements in participants perceptions of both safety and satisfaction with the home, nearby streets and local estate (48,50). However, Stafford et al. (48) found differences between ethnicities in the intervention and control groups, although not statistically significant. For example, Black, South Asian and Other participants in the intervention group all saw

improvements in relation to the perceived fear of crime against the person, however, in the control group, results indicate a higher level of improvement for Black participants and a deterioration for South Asian participants. Improvements in fear of property crime were also seen for South Asian and Other participants in the intervention group but a deterioration seen for Black participants. Levels of satisfaction with the local area also fell slightly for Black and South Asian participants in the intervention group and increased in the control group. The authors note that although the comparator area was chosen to reduce the possibility of contamination of interventions from intervention areas, they do note the overlap of area-based initiatives and the possibility that interventions may have been in progress in comparator areas (48). Evidence from Curl et al.'s (52) of a strong association with improvements in mental health and external and internal fabric works such as cladding and improvements to communal areas, one to two years following intervention highlights the potential of interventions aimed at improving the physical attractiveness of an area. Curl et al.'s (52) exploration of whether different categories of improvements with urban regeneration programmes cure or prevent illness, found that recovery from mental health problems was associated with fabric works, unfortunately, non-British participants were least likely to receive fabric works. Similarly, studies with low number (<5%) of BME participants or lack of analysis of results to delineate the impact on BME participants also report increases in the number of households reporting an improvement in the reputation and physical attractiveness of the immediate renewal area and in neighbourhood satisfaction, the general appearance of the area, the reputation of the area and environmental aspects such as levels of rubbish and litter (48,50,54,59). These are important findings as there is evidence that individuals who perceive their built environment to be of poor quality, are more likely to report CMDs (72). In addition, factors such as poor architectural design, land use, area walkability and connectedness, lack of access to green space, exposure to violence, and housing quality have all been associated with mental distress (68,72–75).

None of the included studies discuss the level of community engagement or approaches to promote community engagement as part of the regeneration programmes. In relation to participation by households at a more local level, one study highlights the positive association between receiving a

new kitchen and bathroom and mental health one year following the intervention, with this being one area where householders were able to contribute to decisions concerning colour and layout (52). Whilst this involvement was on a local level as opposed to the wider regeneration programme, this highlights the benefits of being involved in decision-making. Using qualitative data, Allen (76) suggests that the way in which individuals experience urban regeneration and housing renewal may be explained by personal control and highlights the relationship between opportunities to exercise control and health outcomes. Allen (76) also suggests that choices given to householders during urban regeneration are often limited and somewhat tokenistic, as in the GoWell studies (52) where householders were given limited opportunities to contribute to decision making and limited choices. It is clear that there are a number of barriers to increasing control for BME groups in relation to housing in particular (40). The value of supporting householders through an intervention process is highlighted in a study evaluating a targeted housing intervention for individuals with CHD. The majority of participants in this study were owner-occupiers and half the participants are described as Southeast Asian (64) and were provided support to access funding for the interventions and supported through the intervention process. The author highlights the value of project workers providing support throughout the intervention process on the extent of improvements seen in mental health and anxiety (64) Community initiatives to increase community empowerment found limited evidence of initiatives targeted at BME groups, such groups often described as "hard to reach" (40).

Community engagement in housing and area regeneration provides an opportunity to increase empowerment both on an individual and community level by providing opportunities to be heard and to be involved in decision-making (31,32). There is evidence that community engagement in urban renewal programmes can lead to increased empowerment, social activity, connectivity, social cohesion, trust, pride in the neighbourhood and sense of community (35). There is also evidence of participation by BME groups in regeneration programs but often at an information level only (39). A report by Shelter (77) highlights that this lack of participation by BME groups extends to accessing housing services and highlight an absence of knowledge of housing rights and awareness of housing services among BME groups. The report highlights additional barriers, including practical issues such

as physical or mental health difficulties, housing service operating times, fears around the cost of services or perceived limitations of access due to immigration status, language and cultural barriers (77). If you feel empowered, you might also be more likely to feel you have control over your destiny, leading you to approach challenges in a pro-active manner (78–81). A lack of personal control however, is associated with depression and anxiety and predictive of a more passive coping style (78–81). Furthermore, a lack of resources to influence your surroundings is likely to exacerbate this perception of low personal control, especially true for individuals living in deprived communities (78,81–84). The process of regeneration and decision making can be experienced negatively by residents and a source of stress, with residents reportedly feeling resigned to the fact that regeneration plans had been made and were going ahead (76). However, following the completion of regeneration, some residents reported that they had found ways to increase their personal control during the process of improvements made in their homes, leading to a reduction in stress (76). In an exploration of safety both inside the home and in the neighbourhood, Allik and Kearns (85) found that non-British citizens were less likely to feel safe indoors than British born individuals, and British citizens born outside of the UK were less likely to report feeling very safe outdoors. They also found that factors associated with social cohesion such as social support, connectivity and trust, were strongly associated with safety indoors and in the neighbourhood. Empowerment in relation to inside the home was measured in the relationship between tenant and housing provider with participants asked how satisfied they were with the way in which information was communicated to them by their housing provider. In relation to the neighbourhood, they measured the extent to which an individual had influence over decisions relating to their local area. Allik and Kearns (85) found empowerment to be the strongest predictor of feeling very safe in the home and the neighbourhood, further highlighting the importance of empowerment and involvement in decision making. This research is focused on social housing and it is important to consider how these relationships may differ for BME groups living in owner-occupier or private rented accommodation.

Regeneration can often also include relocation and moving to a new place which may impact social and community connections and influence a sense of belonging, and this may be particularly

important to BME groups. Ambrose (50) found a significant increase in participants reporting that they knew people in the community "very well", together with increases in the number of participants reporting the extent to which they felt they "belonged" in the community. In their report on ethnic diversity, neighbourhoods and housing, the Joseph Rowntree Foundation (86) report on the positive aspects of social cohesion which can develop as a result of settled minority groups, such as specialist shops, culturally sensitive services, religious and cultural venues, activities and interest and the development of social networks. Access, therefore, to these important components of the local area are therefore essential considerations in where BME groups choose to and feel able to live (71). Fears of racial discrimination or harassment are further likely to limit neighbourhood and area choices for BME groups (87–89). There are also potential differences in generational perspectives, with older generations prioritising community connectedness, compared with younger generations who may perceive community ties as less important and prioritise other things such as schools and area safety (71,90). Qualitative research also highlights that compared with the majority, older minority groups are least likely to move to new or rural areas following retirement due to the importance they place on access to local services and community connectedness (90). While the proportion of BME participants were low at less than 3%, Kearns et al. (58) highlight the differential impact of housing interventions on different household types, suggesting that older people were less likely to report improvements in perceived psychosocial benefits of the home. Similarly, differences might exist in relation to recent inpatriates, refugees and asylum seekers, where connecting with other similar individuals are particularly important and access to services which offer appropriate cultural and language support may be easier in areas with higher numbers of recent inpatriates. Chahal (86) highlights the evolving nature of ethnic groups and points out that each ethnic group is in a transition of evolving their identity and integrating to their surroundings, therefore the needs for each group are also likely to differ and change over time.

The studies included in this review focused on social housing and social housing is seen as an indicator of poverty, however, within some minority groups such as Indian and Pakistani, there are high levels of home ownership (91). It is argued, therefore, that existing explanations of the link

between housing tenure and health for majority groups do not adequately explain the relationship for BME groups (92). It is important therefore to consider how indicators of poverty may differ between minority and majority groups. Smith (8) provides evidence of some of these differences, and points out for example, that at the same level of income, Black households will have considerably lower wealth than White households. Smith (8) also concludes that within the UK, housing tenure is not an adequate marker of housing quality, reporting that although South Asians may be more likely to be owner-occupiers, they are more likely to be living in older, unmodernised and overcrowded homes. Accurate measurement therefore of ethnicity, socioeconomic position, social disadvantage and racism are imperative to understanding and addressing inequalities in health for minority ethnic groups (12).

The results from this review support findings from previous systematic reviews, that there is a lack of consistent evidence of improvements to mental health following urban regeneration. As with earlier reviews, this may suggest that assessment of outcomes at an area level may dilute individual benefits following urban regeneration. Where papers considered analysis by BME groups, differences in the prevalence and extent of improvements seen when comparing these groups may indicate differing needs and impact of urban regeneration. For example, the reported differential impact of housing improvements including moving to a new home based on household type may conceal important detail relating to needs of different BME groups (58). This review supports existing evidence of the potential for targeted housing interventions to increase warmth and energy efficiency have the potential in leading to improvements in mental health for vulnerable individuals.

One reason why we might not see the direct impact of urban regeneration on measures of mental health is that the quality of where people live is only one of a number of factors which impact on health, mental health and wellbeing. Lack of findings relating to improvements in mental health in the wider population and in BME communities may represent the complexity of CMDs and other mental health disorders. There is a dearth of research into the causes and factors associated with CMDs and although the search continues, there is certainly no definitive answer. There are in fact many factors thought to be involved, suggesting that regeneration and housing improvements are insufficient to lead to measurable improvements in mental health. If your economic situation for

example, remains the same, and daily decisions such as whether to eat or heat your home persist, or if your home remains overcrowded, then the positive effects of any improvement is likely to be limited. There are also potential negative impacts of living in an area undergoing urban regeneration that are not fully considered in studies exploring the impact of urban regeneration on mental health, as proposed by Allen (76). Furthermore, if you belong to a "hard to reach" community, you may be less likely to participate in community engagement initiatives, reducing the opportunities to influence your surroundings and feel that your opinion and needs have been heard.

How might the research conducted to date inform future research and policy initiatives?

The final aim of this study was to consider how future research and policy might be informed and this review highlights several areas which might be improved upon in future research. The inclusion of meaningful demographic information on ethnicity is essential for researchers to ensure that their participant groups are representative of the wider population, which will increase methodological quality as well as provide researchers with data at an appropriate level to enable an analysis of results to explore differences by ethnicity. Researchers should also provide a clear rationale and description of their decision-making processes in relation to the categorisation of ethnicity and how they intend to use that information. Future researchers may, therefore, consider including, for example, the UK Census question on ethnicity to standardise the approach.

Language and culture are potential barriers to BME groups engaging in research. Only one paper in this review provided language support and one paper actively discouraged participation by individuals unable to complete outcome measures in English (50,54). Therefore, by making adaptations for language for example, future researchers may increase participation from BME groups. Furthermore, the use of focus groups may enable the establishment of a shared, agreed language and understanding of mental health and wellbeing which was reported as an issue in one included study (50). The inclusion of validated translated measurement tools may also enable participation and increase representation from minority groups in important research. Aspects of housing identified as relevant for certain BME groups, such as overcrowding, living close to individuals with a similar background and connections with the community may be areas to consider

for future research. The studies used a variety of measures which again reduced comparability, therefore the development of validated tools for measuring the psychological and social aspects of the urban environment are also important. As is obtaining baseline measures of the quality of housing and the urban environment.

One paper reports the opportunity for participants to be involved in the choice of colour and layout in relation to new kitchens and bathrooms and participant views on this may add additional insight on the impact on empowerment and control (52). Therefore, future studies exploring the impact of additional support and of choices made available to individuals receiving interventions or of being in receipt of interventions with no level of individual participation in choice, for example, may allow this area to be explored in more detail. Community engagement initiatives, involving meaningful participation and joint decision-making by all groups affected by potential urban regeneration programmes are highlighted as a potential mechanism to improve individual and community empowerment. The use of creative methods of engaging communities to increase engagement and overcome barriers to participation is vital in this respect. The relationships between empowerment, safety both in the home and in the neighbourhood as highlighted by Allik and Kearns (85) from a BME perspective are important areas to explore, particularly in relation to individuals living in owner-occupier or private rented accommodation.

Finally, ways of embedding research on mental health within urban regeneration projects may allow more contribution by researchers, which may increase the quality of research conducted and increase the generalisability of findings. For example, the use of the REIA as part of the regeneration process to both consider and gather outcomes relating to the impact of regeneration on ethnic groups but also to use that data to inform future policy.

Limitations of this review:

This review considered only longitudinal cohort studies and excluded other designs such as cross-sectional studies and those which did not assess pre and post-intervention mental health outcomes and this clearly limited the number of studies which could be included in this review. Extending the search strategy, therefore, to also include cross-sectional studies relating to both

experience and outcome of urban regeneration may have allowed a more detailed understanding of the experience of BME groups to be explored. Cohort studies do introduce confounding factors, and, given the time between baseline and follow up, it is not possible to be sure that any changes seen over the time of the study were as a direct result of urban regeneration. The use of control groups has the potential to minimise these confounding factors, however control groups must be selected carefully to avoid contamination of intervention. There was some evidence for example that control group participants may have already experienced changes to their urban environment in relation to regeneration projects because of the wide areas some of the regeneration projects related to, for example NDC areas (48,49). In addition, control groups for other studies consisted of households who were waiting to receive housing interventions (51–53) and again, these households may have already benefited from area-wide regeneration initiatives.

All 12 studies in this review related to the urban regeneration of social housing and this limits the findings in relation to certain BME groups who are more likely to be owner-occupiers. Extending the search strategy, therefore, to include studies exploring targeted housing interventions in addition to urban regeneration programmes, may have addressed this issue. This review is also limited by searching only three electronic databases which may have introduced bias; however, attempts were made to select the most appropriate databases during the initial search and scoping stages of this review. This review is also limited by searching only published articles and undertaking a limited review of additional references and excluding grey literature. The use of a wider search strategy, the inclusion of unpublished studies and grey literature and contacting researchers with an interest in this field in future reviews would reduce any potential bias and ensure that all appropriate literature is considered.

A further limitation of this review is the heterogeneity of the included studies in terms of area, funds and interventions which were undertaken during their respective regeneration programs, thus limiting their comparability. Furthermore, low response rates and high attrition levels may have introduced a sampling bias. The inclusion by researchers of information relating to dropouts and comparison with responders would have allowed the issue of sampling bias to be considered.

There is an implicit expectation that improvements to the urban environment will lead to improvements in mental health and there appears to be limited focus on the potential negative impact of the urban regeneration approach in the studies in the present review. For example, the GoWell studies report a deterioration in physical health, suggestive of the possible negative impacts of urban regeneration (51–53). Furthermore, Egan et al. (53) hypothesised that living in an area undergoing demolition would have a negative impact on mental health, however this was not the case and small improvements to mental health in the demolition group were reported. Extending the search strategy for this review to include studies which specifically explored potential negative aspects of urban regeneration would have addressed this and ensured that negative impacts were not overlooked.

Implications for services

Findings from the English Health Survey indicate that prevalence rates of CMDs are increasing, with evidence of more variation between ethnic groups for women and not men (2). In addition, those who are female, White British and aged 35 – 54, are most likely to report accessing treatment for a CMD (2). There are two resulting implications for services; resourcing and accessibility of services to BME populations. In relation to resourcing, services may consider whether their employees are representative of the wider population which they serve, and this might be achieved by actively recruiting from diverse backgrounds, including BME groups. Adapting services to allow time and resources for creative engagement with diverse communities across all age groups or by moving services from traditional settings to community settings may also lead to increased accessibility. Use of culturally sensitive, validated tools to assess the extent of mental health difficulties is also important in order to fully understand the nature of difficulties experienced. It is important also for services to make adaptations to accommodate language and communication needs and also use translators when needed.

Ambrose (50) highlighted the reluctance of Bangladeshi participants to discuss mental health difficulties and noted the same reluctance was not present in relation to discussing physical health

concerns. Increasing psychological thinking within these communities and within the wider systems which they are likely to encounter, may lead to a reduction in stigma around mental health difficulties. Clinical Psychologists play a key role in increasing psychological thinking and this often relates to their immediate clinical role, involving service users and other professionals, including the multi-disciplinary team. There are also opportunities to increase psychological thinking on a wider level within organisations which BME groups may access. These opportunities may arise from working with organisations, for example, who provide housing or other services such as social care, to vulnerable individuals, refugees and asylum seekers, to increase psychological thinking and develop an understanding of the impact of the urban environment on mental health and accounting for dimensions concerning ethnicity, such as discrimination. In addition, involvement in developing and contributing to policies, in particular, public health policy, would provide the opportunity to further increase and embed psychological thinking into public health.

There are also valuable opportunities to increase psychological thinking in physical health and medical service settings and this again highlights the significance of the role of psychologists working in such settings. As there appear to be fewer barriers, including stigma, to BME groups accessing medical care in relation to physical health, there is greater opportunity to increase psychological thinking for BME groups within these wider health settings. The use of social-prescribing, increasing access to social activities for example, might increase the opportunities to engage with BME groups further and provide opportunities to increase psychological thinking, such as the potential for physical activity to lead to improved mood or the associations between physical health and mental wellbeing.

Traditional services typically view mental health difficulties as located within the individual. By including wider environmental factors, a greater understanding of what contributes to and maintains an individuals' distress can be achieved. Developing a shared understanding of difficulties with for example quality of housing, perceptions of safety within the home and in the local area and how it impacts on the individual may allow individuals to feel validated, leading to positive

therapeutic alliances. Accounting for these wider factors may also inform treatment options or highlight the need for signposting to other services.

This review has highlighted that indicators for poverty and deprivation such as housing tenancy, may be less relevant for certain BME groups, such as the higher likelihood of Pakistani individuals to be owner-occupiers and there is a need therefore to understand better the relevance of socioeconomic status for BME groups. The National Health Service as a whole, collates a wide range of demographic information and factors relating to socioeconomic status and it is important for clinicians to understand the relevance of this information and how it is perceived, and to incorporate this information into individual and systemic formulations, in order to inform treatment and care provided to BME individuals.

In addition to CMDs such as anxiety, there is evidence that the urban environment may contribute to increased severity of mental health difficulties to severe disorders such as psychosis (93). This may be particularly relevant to BME males, as Black males for example are at an increased likelihood of being diagnosed with schizophrenia and more likely to face detention under the Mental Health Act (9). In addition to the increased likelihood of being detained, these individuals are also more likely to return to the same deprived area or conditions, potentially increasing the likelihood of the urban environment to exacerbate existing mental health and other social difficulties.

Conclusions

There is limited available evidence to establish the impact of urban regeneration on the mental health BME groups. This review does however add to existing evidence of the over-representation of minority and BME households living in deprived neighbourhoods as well as providing evidence of the types of housing problems BME groups face, including problems with damp and heating and overcrowding. This review supports existing evidence of the potential for targeted housing interventions to increase warmth and energy efficiency have the potential in leading to improvements in mental health for vulnerable individuals. The results from this review also

support findings from previous reviews, that there is a lack of consistent evidence of improvements to mental health following urban regeneration.

Inequalities in health have become a topic of concern for many reasons and highlighted as essential to enable individuals to achieve the level of health and wellbeing set out by the WHO definition of health (15,16). Inequality relating to minority groups is also highlighted as a factor which deserves attention both in relation to health and social factors such as living conditions which may have a direct impact health and wellbeing and to indirect factors such as how a person feels about where they live and how much of a sense of control and empowerment they feel over their life (3,13,23,28,32). Increasing prevalence rates of mental health difficulties, together with growing pressures on mental health services requires urgent consideration of alternative pathways to reducing the mental health burden. A focus on the social determinants of mental health and health inequality has drawn attention to the issue of the urban environment and its association with mental distress, however it is imperative that all groups are included in the pursuit for equality and in this regard, accounting for racial discrimination is vital. To this end, high-quality research in this area is urgently needed in order to begin to level the playing field.

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Can the contemplation of urban environments change the way we think and feel?

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Abstract

Objectives: Urban living increases the likelihood of developing common mental health disorders, however the underlying psychological processes are not well understood. This study tested the hypothesis that brief exposure to physical and social qualities of neighbourhoods is associated with changes in decision-making, cognitive and affective mechanisms with most marked changes seen in depressed/anxious individuals.

Method: Two participant groups (*N*=218) completed an online questionnaire. One group (*N*=108) were exposed to five images of desirable urban environments (DUE) while the other group (*N*=110) were exposed to five images of undesirable urban environments (UUE). Participants completed measures in the following order; depression and anxiety (PHQ-9, GAD-7), locus of control V.1 (LOC), anticipation of threat V.2 (AOT), consideration of future consequences V.1 (CFC), viewed five images and completed associated questions, a future discounting task, LOC V.2, AOT V.2 and CFC V.2 measures.

Results: No significant differences in post-contemplation scores in LOC, AOT or CFC or future discounting between image type were found. Being non-depressed/non-anxious was associated with becoming more internal on the LOC after image contemplation, to a greater extent than depressed/anxious. Depressed/anxious participants were more likely to discount the future, indicating preference for an immediate versus delayed reward.

Limitations: Split half methods for measures may have introduced practice effects thus influencing post-contemplation scores.

Conclusion: Brief contemplation of images of urban environments can alter how we consider our future, our sense of personal control and how we attend to threat. Along with accruing evidence of the toxicity of the urban environment, there is a case for urbanicity to be a matter of public health concern.

Key words: urbanicity, depression, anxiety, future discounting

Introduction

Previous research has established that living in an urban environment increases the likelihood of developing common mental health disorders (CMDs) such as depression and anxiety and that prevalence rates increase with greater levels of urbanisation (1–3). Despite the wealth of research on this 'urbanicity' effect, the psychological processes involved are not well understood, in part because most research has focused on population density, rather than the relationship between urban living and how we respond to it (4,5). Individuals' responses to the physical attributes and the social landscape of the urban environment are thought to partly determine this 'urbanicity' effect (6,7). Area and local level factors including deprivation levels have been identified as important, with high deprivation associated with high psychological distress and areas of affluence associated with less distress (8).

Actual and perceived quality of the built environment have also been indicated as important in understanding the relationship with mental health. Poor architectural design, land use, area walkability and connectedness, lack of access to green space, exposure to violence and housing quality have all been associated with mental distress (1,7,9–11). Individuals who perceive their built environment to be of poor quality are more likely to report CMDs (11). Targeted improvements to housing have been associated with improvements to mental health and there is evidence, albeit weaker, that urban regeneration which commonly targets the most deprived areas, also lead to improvements in mental health (12,13). Furthermore, there is evidence of an association between CMDs and perceptions of social disorder, perceived risk of being a victim of crime, low levels of social support and having a perceived lack of belonging (14–16). Latkin and Curry (11) found a strong prospective association between perceived neighbourhood characteristics (litter, vandalism, vacant housing, crime) and depressive symptoms and highlight the importance of chronic stress. They suggest that it is the lack of control that individuals feel they have over neighbourhood social disorder which generates feelings of stress and that cumulative effects of chronic stress are closely associated with CMDs (11). Taking account of this evidence, personal control, social support and

restoration have been highlighted as important factors in furthering our understanding of the relationship between the physical qualities of urban environments and mental health and well-being (17).

An individual's feelings about a place are thought to be shaped by what the place has to offer, which have meaning for that individual and which "uphold or improve their standard of living" (18, p 25). Building on Gibson's (19) theory of direct perception, a reciprocal relationship between individual and environment is proposed, suggesting that the range of affordances that an environment offers will be restricted by what the individual perceives and the means and capabilities which the individual has, in accessing those affordances and vice versa (20). The lack of availability of environmental goods in deprived areas, such as having a safe place for children to play have been strongly associated with higher levels anxiety and depression, poorer health and higher levels of poor health behaviours (14). Using a network analysis approach to explore the associations between mental health symptoms and two environmental factors; social cohesion and social disorder, McElroy et al. (21) also explore the role of neighbourhood deprivation. They found a negative association between social disorder and social cohesion, such that high disorder was associated with low cohesion. The strongest relationships between disorder and cohesion were found in relation to paranoia, with a negative association with cohesion and positive association with disorder. Anxiety was also strongly and negatively associated with cohesion. With no direct association found with depression, the authors suggest that anxiety and paranoia, mediate the influence of the urban environment on mood. Their findings also indicate a different pattern of these associations, dependent on deprivation level, with the strongest associations found with high deprivation. The authors conclude that the associations between components of the neighbourhood environment and mental health symptoms increase in relevance as deprivation increases (21).

The cognitive model and information processing biases

The evidence cited above highlights the importance of not only considering objectively observable aspects of the environment but an individual's perception of the quality of their social and

physical environment for understanding the relationship between environment and mental health. This is consistent with the premise of Beck's cognitive model, which is based on a key underlying aspect considered central to human behaviour, that our affect and behaviour is determined by the way we interpret events (22). Negative cognitive content and biased information processing are prominent aspects of the cognitive models of depression (23). There is evidence that depressed individuals have a greater tendency to attend and react to negative emotional stimuli more than positive stimuli e.g. sad versus pleasant images (24). Due to the high comorbidity of depression and anxiety, it is argued that they share the same biases (25). There is growing evidence that feelings of depression and anxiety are not only restricted to users of mental health services but exist on a continuum in the general population (26,27). Characteristic levels of factors purported to underlie depression and anxiety such as biases in locus of control (LoC), anticipation of threat (AoT) and consideration of future consequences (CFC) have been demonstrated in both clinical and non-clinical samples (28–30).

LoC refers to the extent to which an individual perceives events in their life as being a consequence of their own actions and therefore perceived to be under their control. LoC is assessed in terms of whether one believes that events in their lives result from their own effort and skills (internal control) or stem from external forces (external control) such as chance, luck or powerful other (31). LoC has been shown to be non-stable subject to daily fluctuations and strongly associated with daily levels of anxiety and hassles (32). The relationship between an external LoC and CMDs has been evidenced (29,33). Research exploring urban and rural variations in LoC at area and local level however present less consistent findings (34–36).

Heightened attention to threat has been shown to be associated with CMDs, with individuals displaying a greater tendency to attend to threatening words versus neutral words, for example (37). In individuals with paranoid delusions, exposure to a busy urban environment to simulate a real-life situation was associated with increased anxiety, depression and pessimism and a heightened attention to threat (38,39). Brief visits to deprived areas have been associated with a reduction in levels of social trust and increase in levels of paranoia, compared with visits to more affluent areas (40,41).

Studies have also found an association between self-reported levels of depression and increased estimates of future threatening events (30,42).

Studies have demonstrated differences in the extent to which individuals are likely to consider future consequences in choosing their present behaviour and it has been identified as an important predictor of health behaviours (43). A paradigm used to explore potential influences in decision making is future or temporal discounting, where individuals are asked if they would prefer a small reward now versus a large reward in the future. Amongst the factors thought to be related to the tendency to discount the future are poverty, affect and the environment. For example, evidence has shown that future discounting is a characteristic of people living in low resource environments and that people living in poverty are more likely to be risk averse and discount the future more than wealthier people (44–46). This tendency to discount the future potentially perpetuates the status quo of poverty (44). After viewing images depicting poverty, individuals are more likely to choose an immediate versus delayed reward than those viewing images depicting affluence (47). There is also evidence that induced sadness and stress increase future discounting while induced positive affect is associated with reduction in future discounting (48,49). Furthermore, there is growing evidence that brief exposure to images of places influence social and economic decision making (47,50). One study reports that viewing images of rural/green environments seems to encourage delayed reward more than viewing images of urban environments (51). Studies exploring the relationship between future discounting and depression have been less consistent in their findings, with evidence that individuals with major depressive disorder (MDD) display more future discounting next to evidence demonstrating less future discounting in individuals reporting anhedonic symptoms (52,53).

A recent study using a university student sample explored the effects of contemplating images of desirable or relatively undesirable residential urban environments on these underlying psychological mechanisms related to depression, anxiety and paranoia (4). They found that following contemplation of image showing both relatively desirable and undesirable environments, participants displayed elevated external LoC, increased anticipation of threat and reduced consideration of future consequences. However, anticipation of threat showed greater increase following contemplation of

the undesirable compared to the desirable urban environments. Building on research findings to date, this study will explore the influence of contemplating images of urban environments on AoT, CFC, LoC and economic decision making explicitly in relation to levels of depression and anxiety.

Hypotheses/Objectives

1) Participants scoring high on measures of depression and anxiety will show more future discounting across image conditions (desirable/undesirable) compared to those scoring low for depression and anxiety.

2) Contemplating images depicting relatively undesirable urban environments (UUE) will be associated with greater future discounting than will contemplating images depicting relatively desirable urban environment (DUE).

3) Participants scoring high on measures of depression and anxiety will display a more external LOC more AoT and will report less CFC when compared with individuals scoring low on measures of depression and anxiety.

4) Contemplation of UUE images will induce more external LOC, more AOT and less CFC compared to DUE images. This priming effect will be most marked in participants who endorse higher levels of depression and anxiety.

Method

Ethical Approval

Ethical approval was gained from the University of Liverpool's Research Ethics Committee (ref: IPHS-1415-LB-222).

Participants

Participants were recruited on-line via UK mental health charities (Anxiety UK, Citizen Scientist and Friends in Need). Participation was voluntary, and the study took approximately 20-30 minutes to complete. The study comprised two conditions (UUE and DUE image contemplation) in a between participant cross-sectional design. A total of (N= 225) participants were recruited, resulting in a total sample of 218 for analyses, following the removal of incomplete data (DUE: N= 110, 30 males and 80 females; UUE: N= 108, 19 males and 89 females).

Procedure

Two versions of the survey, one for each condition (UUE and DUE) were hosted by Qualtrics https://www.qualtrics.com at different times. At the beginning of the study, participants were presented with participation information about the study and a consent form (Appendices C and D). Participants were asked to complete demographic details (Appendix E). Participants then completed measures for depression and anxiety (Appendix F) and the first split half set of self-report measures on CFC, LoC and AoT (Appendix G). As part of each condition, participants viewed a set of five selected images reflecting relatively UUE while the other group viewed a set of five selected images of relatively DUE (Appendices H and J). To facilitate active contemplation of the images, respondents were asked a set of five questions about each image to which they were asked to respond on a 0 - 5 Likert scale (How nice is this place? How much would you like to live in this place? How much antisocial behavior might you expect to see in this place? How rich or poor are the people who

live in this place? How much are the people who live in this place likely to mix on friendly terms with each other?) Following presentation of the images, participants took part in a decision-making task: future discounting. Participants were asked "Imagine you were offered a) £30 today or b) asked to wait 90 days to receive £100, which would you choose?" Participants were then asked to complete the second 'split half' set of self-report measures on CFC, LoC and AoT. Finally, participants were asked the same five questions posed during contemplation of the images in relation to where they currently live.

Due to the anonymous nature of the study, withdrawal from the study was only possible by exiting the browser window during completion of the questionnaires and participants were made aware of this within the consent form sheet (Appendix D). Incomplete datasets were therefore considered to indicate a participant's withdrawal from the study and were therefore excluded from analysis. Following completion of the questionnaires, participants were presented with contact details for local and national support agencies should they be experiencing psychological distress. They were also provided with contact details for the researcher for further study information. Participants were also offered entry to a prize draw for one of three £50 high street vouchers on providing their contact details.

Measures/materials

Measures used were presented online in the following order (Appendix E, F and G):

- Demographics, including- age, sex, ethnicity, current income range and experience of crime.

- Patient Health Questionnaire-9 (PHQ-9). A 9-item self-report depression scale with excellent internal consistency with a Cronbach's α of 0.89 and "excellent" test-retest reliability (r = 0.74). Scores of <5 indicate the absence of depressive symptoms (54) .

- Generalised Anxiety Disorder-7 (GAD-7). A 7-item self-report anxiety scale with excellent internal consistency (Cronbach's α =0.92) and robust correlations with the Beck Anxiety Inventory (r = 0.72). Scores of >5 indicate the absence of anxiety symptoms (55).

- Locus of control (Rotter, 1966). A 13-item self-report scale with good internal consistency (Cronbach's α = 0.74) and test retest reliability of .61 (56). It is a measure of internal versus external sense of control of one's life. For paired statements, participants indicate which statement best describes how they feel. Questions "the idea that teachers are unfair to students is nonsense" and "most students don't realize the extent to which their grades are influences by accident happenings" were removed in order to have an equal number of pre-and post-image questions.

- Anticipation of threat is a 7-item self-report scale with good internal consistency (Cronbach's α = 0.78), which measures participants beliefs in the likelihood of threatening events taking place (42). To have an equal number of pre-and post-image questions, the item "your mail is read without your permission" was removed.

- Consideration of future consequences (43). This is a 12-item self-report scale measuring the extent to which people consider distant versus immediate consequences of potential behaviours. The measure has good internal consistency reliability (Cronbach's α = .86) and test-retest reliability .72.

- Images – Ten residential place images, five for each condition, obtained from an earlier study (4).

Power Calculation

An a priori power analysis using G-Power software indicated a required 107 participants for each condition (N=214), to have 80% power for detecting a medium sized effect when employing the traditional $p < .05$ criterion of statistical significance.

Statistical Analyses

Tests for normality indicated that AoT scores were non-normal and were therefore log-transformed prior to analysis (57). Paired samples *t*-tests were conducted to compare participant responses to "How nice is this place" for both UUE and DUE image types with ratings of participants' own residence. Chi-square tests for independence were performed to explore differences in future discounting across image condition and depression/anxiety level. Pearson's r correlations were performed to explore the relationship between measures of depression and anxiety and the pre-contemplation measures of CFC, LoC and AoT to determine their level of association in this study sample. Pearson's r correlations were also conducted to explore the relationship between measures of depression and anxiety with demographic information on income level and experience of crime. Paired samples t-tests were conducted to compare pre- and post-contemplation levels of CFC, LoC and AoT across image type. For each of these measures, pre- and post- contemplation difference score were computed into a new variable. Independent samples *t* -tests were conducted to determine whether there were significant differences in the mean calculated difference scores for the two conditions (UUE vs DUE). Independent samples *t*-tests using the calculated CFC, LoC and AoT difference scores by image type and depression/anxiety level were conducted based on two groups using the PHQ-9 and GAD-7 scores; scores of 0 – 5 were categorised as not depressed or anxious and scores of >5 were categorised as mild+. Finally, dependent on the outcomes of the independent samples *t*-tests, hierarchical regression was conducted to explore the extent to which change in CFC, LoC or AoT following image contemplation was related to depression and anxiety levels and image type.

Results

Participant demographic information is presented in Table 1 for each image condition; the two groups differed significantly in frequencies of; age: $X^2(6, N = 218) = 19.98$, $p < .05$; salary range: <30,000 and >30,000, $X^2(1, N = 218) = 7.17$, $p < .05$; and ethnicity, white v all other: $X^2(1, N = 218) = 4.85$, $p < .05$. The two groups did not significantly differ by gender; $X^2(1, N = 218) = 2.93$, $p > .05$;

Table 1. Participant demographics.

	Undesirable images (*N*=108)	Desirable images (*N*=110)
Age range	Frequency (%)	Frequency (%)
18-24	24 (22)	5 (4)
25-34	34 (31)	43 (39)
34-44	15 (14)	26 (25)
45-54	15 (14)	22 (20)
55-64	13 (12)	7 (6)
65-74	6 (6)	5 (4)
75-older	1 (1)	2 (2)
Female:Male	89:19 (82:18)	80:30 (73:27)
Ethnicity:		
White	102 (94)	94 (85)
Mixed/Multiple ethnic groups	1 (1)	4 (4)
Asian/Asian British	1 (1)	10 (9)
Black/African/Caribbean/Black British	1 (1)	2 (2)
Other	3 (3)	0
Missing	1 (1)	0
Annual income:		
< £10,000	38 (35)	18 (16)
10,000 to 20,000	28 (26)	21 (19)
20,001 to 30,000	22 (21)	33 (30)
30,001 to 40,000	11 (10)	17 (16)
40,001 to 50,000	4 (4)	12 (11)
50,001 +	4 (4)	9 (8)
Experiences of crime over past 5 years		
Never	67 (62)	66 (60)
Once	20 (19)	23 (21)
Twice	12 (11)	16 (15)
Three or more times	9 (8)	5 (4)

Levels of depression and anxiety were found to have statistically significant: positive correlations with experience of crime ($p < 0.01$), and negative correlations with income level ($p < 0.01$) (Table 2).

Table 2. Correlations between measures of depression and anxiety (PHQ-9 and GAD-7) and income level and experience of crime.

	Income Level	Crime Level
PHQ-9	-.293**	.242**
GAD-7	-.282**	.186**

**p < .01

Image contemplation questions

Participants scores on 'how nice is this place?' indicated that DUE images were rated as nicer than the UUE images; (M_{DUE} = 4.45, SD = .89 versus M_{UUE} = 2.48, SD = 1.07). Paired samples t-tests indicated that, participants found the UUE images significantly less nice than their own residence $t(107) = -13.87$, $p < .001$. The difference between ratings of DUE images and own residence was not significant $t(108) = 0.90$, $p = .367$.

Hypotheses 1 and 2 - Future discounting

No significant relationship was found for image type (DUE or UUE) and future discounting; X^2 (1, N = 217) = 1.88, p = .17. There was a significant relationship between future discounting and levels of depression; X^2 (1, N = 217) = 9.33, $p < .05$ and anxiety; X^2 (1, N = 217) = 7.17, $p < .05$, (Table 3).

Table 3. Descriptive statistics for image type on future discounting.

	Future discounting Accept £30 today (%)	Wait 90 days to receive £100 (%)
Undesirable (N= 107)	15 (14.0)	92 (86.0)
Desirable (N= 110)	9 (8.2)	101 (91.8)
PHQ-9		
None	3 (1.4)	87 (40.1)
Mild+	21 (9.7)	106 (48.8)
GAD-7		
None	5 (2.3)	96 (44.2)
Mild+	19 (8.8)	97 (44.7)

Hypotheses 3

LoC and AoT were significantly and positively correlated with PHQ-9 ($p < 0.01$) and GAD-7 scores ($p < 0.05$), with higher depression and anxiety scores associated with low sense of personal control and high levels of attention to threat. However, CFC was not significantly correlated with either depression or anxiety levels (Table 4).

Table 4. Correlations between measures of depression and anxiety (PHQ-9 and GAD-7) and pre-contemplation CFC, LoC and AoT.

	CFC	LoC	AoT
PHQ-9	-.045	.112**	.485**
GAD-7	-.030	.116*	.463**

Note. N=218; CFC = consideration of future consequences; LoC = locus of control; AoT = anticipation of threat.

*p < .05. **p < .01

Hypotheses 4 - Image type

It was hypothesized that contemplation of UUE images would induce more external LOC, more AOT and less CFC compared to DUE images. Paired sample *t*-tests demonstrated a significant change to

responses following contemplation of both DUE and UUE images, with significantly reduced consideration of the future, increased sense of personal control and increased anticipated threat ($p < 0.01$) (Table 5). Independent samples *t*-tests conducted on mean difference change scores demonstrated that contemplation of images of UUE did not significantly alter CFC, LoC or AoT more than contemplation of DUE images (Table 6).

Table 5 - Results of paired samples t-test on outcome measures across both image conditions.

	Pre-test		Post-test			95% CI for Mean Difference			
Outcome	M	SD	M	SD	n		t	df	d
CFC	20.94	4.03	19.03	4.03	217	1.39, 2.41	7.38**	217	0.47
LoC	3.05	1.10	2.63	1.55	218	0.17, 0.64	3.46**	216	0.31
AoT	0.82	0.19	1.00	0.01	218	-0.19, -0.15	-15.43**	217	0.98

CFC = consideration of future consequences; LoC = locus of control; AoT = anticipation of threat.
*p <.05. **p<.001

Table 6 - Results of independent samples t-tests on change scores by image condition.

	Change Score UUE Image		Change Score DUE Image			95% CI for Mean Difference		
Outcome	M	SD	M	SD	n		t	df
CFC	1.78	3.94	2.02	3.68	217	1.39, 2.41	-0.46	215
LoC	0.40	1.82	0.41	1.70	218	0.17, 0.64	-0.04	216
AoT	-0.17	0.17	-0.18	0.17	218	-0.19, -0.15	0.61	216

CFC = consideration of future consequences; LoC = locus of control; AoT = anticipation of threat.
*p <.05. **p<.001

Hypothesis 4 – Depression or Anxiety Level

It was hypothesized that changes on CFC, LoC and AoT outcome measures would be most marked in participants endorsing higher levels of depression and anxiety after contemplating UUE images. An independent samples *t*-test on mean difference scores indicated that, irrespective of image type, non-depressed/non-anxious individuals became more internal on the LoC, to a significantly greater extent than individuals with mild+ depression or anxiety ($p < 0.01$). However, mean difference CFC and AoT scores did not significantly differ across depression or anxiety levels (Table 7).

Table 7 – Independent samples t-tests on change scores by depression and anxiety level across both image conditions.

		Change Score No Depression / No Anxiety		Change Score Depression / Anxiety			95% CI for Mean Difference		
	Outcome	M	SD	M	SD	n		t	df
Dep	CFC	1.69	3.18	2.06	4.19	217	-1.40, 0.66	-0.71	215
	LoC	0.94	1.57	0.03	1.80	218	0.44, 1.37	3.85**	216
	AoT	-0.18	0.14	-0.17	0.19	218	-0.58, 0.03	-0.54	216
Anx	CFC	1.87	3.31	1.94	4.19	217	-1.09, 0.95	-0.13	215
	LoC	0.80	1.55	0.07	1.86	218	0.26, 1.18	3.09*	216
	AoT	-0.18	0.18	-0.17	0.18	218	-0.06, 0.02	-0.84	216

CFC = consideration of future consequences; LoC = locus of control; AoT = anticipation of threat; Dep = depression; Anx = anxiety.

*p <.05. **p<.001

Exploring the change in LoC

With post-contemplation LoC score as the dependent variable, a hierarchical regression explored the extent to which changes on the LoC were predicted by depression or anxiety levels. Exploratory correlation analysis was used to identify potential predictor variables including gender, ethnicity, age, income and crime level and to identify which variables to include in the regression model. Step 1 of the hierarchical regression included gender and pre-contemplation LoC scores and step 2 added PHQ-9 and GAD-7 scores. The overall regression model predicted approximately 17% of variance in post-contemplation LoC scores, $R^2 = .17$, $F(4, 213) = 10.85$, $p < .001$. Gender and pre-contemplation scores accounted for approximately 3% of variance in post-contemplation scores LoC scores, with significant beta values for pre-contemplation LoC but not gender. PHQ-9 and GAD-7 predicted an additional 14% of the variance in post-contemplation LoC scores, with significant beta values for GAD-7 but not PHQ-9. Full details of the hierarchical regression are provided in Table 8.

Table 8. Hierarchical Regression Analysis showing Gender, Pre-contemplation LoC, PHQ-9 and GAD-7 as Predictors of Post-contemplation LoC.

	Cumulative		Simultaneous	
Variable	R^2-change	*F*-change	*B*	*P*
Step 1				
Gender (M/F)	.03	$F(2,215) = 3.28$*	.07	.275
Pre-contemplation LoC			.16	<.05
Step 2				
PHQ-9	.14	$F(2,213) = 10.85$**	.11	.347
GAD-7			.28	<.05

Note. LoC = locus of control; PHQ-9 = depression measure; GAD-7 = anxiety measure.

*p <.05. **p<.001

Discussion

Research has demonstrated that it is both the actual and perceived quality of the social and physical environment that are important for understanding the relationship between environment and mental health (17). Exploring psychological mechanisms potentially associated with this relationship, findings from the present study show that brief exposure to images of residential urban environments is associated with changes in three psychological mechanisms, our consideration of future consequences in decision-making, our sense of personal control and our attention to threat. These findings add to the evidence concerning the rapidity of this psychological response following implicit exposure to urban environments (4,38–40,47).

Image type

The present study hypothesised that briefly contemplating images of undesirable residential urban environments would lead to changes in CFC, LoC and AoT, to a greater extent than would contemplating images of desirable urban environments. However, this was not supported by the findings. Post-contemplation changes in these three mechanisms were seen to a similar extent in both image conditions, with scores indicating less consideration of future consequences, increased attention to threat, and increased sense of personal control. Findings from the present study in relation to changes to CFC and AoT are consistent with existing evidence, that implicit and explicit exposure to urban environments increases threat levels and influences future-oriented decision-making process (4,38–40,47). The direction of change in post-contemplation LoC was unexpected and inconsistent with an earlier study, where post-contemplation of the same urban images in a student sample was associated with an increased external locus of control (4).

This study hypothesised that contemplation of images depicting undesirable urban environments would lead to a preference for an immediate, smaller reward, using the future discounting paradigm, compared with desirable urban environments. This hypothesis was not supported by the findings. Across both image conditions, a high proportion of participants chose to receive the delayed, larger reward, which appears inconsistent with post-contemplation CFC scores, which indicated that

consideration of future consequences decreased across both image conditions. Whilst these findings are consistent with Corcoran et al.'s (4) findings, they are inconsistent with other studies where viewing images depicting poverty increased the likelihood of preferring an immediate, smaller reward compared with affluence images (47), and viewing images and spending time in rural environments was associated with an increased preference for larger, delayed rewards compared to urban environments (51).

Depression and anxiety levels

It was hypothesised that participants scoring high on measures of depression and anxiety would display a more external LOC, more AoT and would report less CFC when compared with individuals scoring low on measures of depression and anxiety and this was supported by the study findings. It was also hypothesised that contemplating images of undesirable urban environments would lead to greater change in CFC, LoC and AoT for individuals with depression or anxiety. However, this was not supported by the study findings. In both image conditions, post-contemplation scores for all participants indicated an increase in internal control and further analysis revealed a significant increase in internal control for non-depressed participants and minimal change in the already external LoC scores for depressed participants. There was a similar statistically significant pattern in relation to non-anxious participants but only in relation to the undesirable urban environment condition. Through regression analysis, only a small amount of variance was explained by depression and anxiety levels. Whilst the overall pattern for the sample is consistent with existing evidence, with higher levels of depression and anxiety associated with a more external LoC (29,33), the post-contemplation changes in LoC in the present study are inconsistent with an earlier study which found no significant changes to post-contemplation LoC scores based on depression or anxiety levels (4).

The results from the present study indicated that higher levels of depression or anxiety was associated with a higher likelihood of choosing an immediate, smaller reward and is consistent with existing evidence in relation to major depressive disorder (53). These findings support the study

hypothesis, that individuals with elevated levels of depression and anxiety will show more future discounting compared to non-depressed/non-anxious individuals.

Daily fluctuations in perceived levels of personal control have been found to be associated with daily levels of stress and anxiety and a more external LoC is associated with depression and anxiety (32). It was hypothesised that contemplating an image of a relatively undesirable urban environment would lead to an increase in reported external control, however results indicated an increase in reported internal LoC and this was found across both image types. During image contemplation, participants were asked "how nice is this place?" and were asked the same question in relation to where they lived towards the end of the study. Participants in the DUE image condition rated both the images and where they lived as similarly nice and both ratings were significantly higher than those for the UUE images. However, the changes in LoC were seen to a similar extent, across both image types. Could each image type have led to this change in LoC in slightly different ways? The UUE images for example were perceived as significantly less "nice" than participants' perception of where they actually live and there may have been some level of comparison making involved which served to reinforce participants perceptions of, for example, their status or level of personal control, leading to an increase in internal LoC. Similarly, the DUE images may have served to reassure or remind participants of their own status or level of personal control, thus leading to the increase in internal control seen.

This study also hypothesised that the greatest changes in LoC would be seen in participants reporting depression or anxiety, yet there was minimal change in LoC for participants also reporting depression and anxiety. In comparison, participants reporting no depression or anxiety reported a significant increase in internal control. In their study of daily fluctuations in LoC, Ryon and Gleason (32) found an interaction between previous day and same day anxiety levels, and suggest that low levels of reported anxiety on one day results in the previous days' anxiety reducing in significance. The authors suggest that if stressful circumstances do not continue into the next day, then the LoC has an opportunity to recover to normal levels. Their findings that individuals consistently reporting high levels of daily stressors and anxiety were also more likely to report a more external LoC, led them to

suggest that prolonged exposure to life stressors and anxiety may result in longer term changes to LoC. Previous studies have evidenced an association between depression and anxiety and an external LoC (29,33,58). The results from the present study may indicate that LoC for individuals reporting depression or anxiety is less susceptible to change in the same way as seen in individuals reporting no depression or anxiety. The present study did not measure daily stressors and the images used, based on desirability, may have been insufficient to invoke the increase in external control seen in previous studies. Participation in the experiment or a part of the experimental process may have invoked factors that were not considered, a resilience factor, for example, acting to reinforce internal control or acting as a buffer against any negative effects. Perception of control is associated with several self-regulatory affective, behavioural and cognitive processes and mediates the way in which individuals deal with and recover from stress or adversity. A high internal LoC for example is predictive of action oriented, problem-focused coping styles, whereas a high external LoC is predictive of an avoidant, passive coping style (59–62). Self-regulation is also thought to be associated with resilience and a recent meta-analysis found self-regulation to be predictive of positive outcomes across a variety of life domains, including performance at work and academia, as well as mental and physical health outcomes (63). In a walking study, participants perception of perceived threat in relation to a deprived area was predicted by personal resilience (41), highlighting the significance of resilience.

As well as being associated with depression and anxiety (37), increased attention to threat following brief exposure to urban environments has been evidenced by several studies (38,39). A study comparing the effects of walking through a deprived with a less deprived area, reported that the deprived area was associated with significantly higher judgements of future threat, lower judgements of trust and lower judgements of wealth in participants ratings (41). The present study found a significant increase in post-contemplation AoT scores, with increases to a similar extent seen across image conditions and depression and anxiety levels. An earlier university student sample study reported a significantly greater increase in AoT scores following contemplation of UUE images compared with DUE images (4). The present study was aimed at a wider population sample, using a variety of online platforms, including ones which focused on depression and anxiety, such as Anxiety

UK, which may explain the different results seen in the two studies. Furthermore, participants in the two image conditions in the present study differed significantly in age, salary level and ethnicity. Corcoran et al. (41) found that perceived neighbourhood wealth and persecutory ideas predicted sense of trust in both neighbourhoods, while personal resilience predicted threat in the deprived neighbourhood. Brief visits to deprived areas have been associated with a reduction in levels of social trust and increase in levels of paranoia, compared with visits to affluent areas (40). Studies have also found an association between self-reported levels of depression and increased estimates of future threatening events (42). During image contemplation, participants were asked five questions which required them to make judgements about the place and the people who might live there including levels of anti-social behaviour, wealth and neighbourhood friendliness, and it may have been these questions which elicited the increased attention to threat. The way in which participants made these judgements may have involved the consideration of contextual cues represented by each image. The impact of these cues is articulated in the "broken window" theory, which posits that such cues are used to make inferences about threat and trust, thus influencing our perception (40). Furthermore, there is evidence that introducing signs of social disorder increase the propensity to violate rules (64) and Nettle et al. (40) suggests that these perceptions also influence our behaviour, with pro-social cues leading to an increase in motivation to behave pro-socially and anti-social cues leading to decline in motivation to behave pro-socially. While this study showed that brief exposure to images of urban environments increases attention to threat, continual exposure to neighbourhood social disorder is considered to contribute to chronic stress, associated with common mental health disorders (11).

This study found that after contemplating either image type, participants' CFC reduced to a similar extent and this was also the case across depression and anxiety levels. This study shows that brief exposure to images of urban environments influences the extent to which individuals consider the future in relation to their present behaviour. Nettle et al. (40) proposes that our response to the environment is continually changing and evolving based on what we perceive within the environment around us and this may explain the changes seen in CFC within this study. This study also found no difference in future discounting across image type but did find evidence of a higher likelihood of

choosing the immediate versus delayed reward in individuals reporting depression or anxiety. Liu et al.'s (47) findings that viewing images depicting poverty increased the likelihood of choosing an immediate versus delayed reward may suggest that the images used in each condition in the present study were insufficiently different to elicit similar findings. The findings relating to individuals reporting depression or anxiety add support to previous studies (53) and adds to existing evidence that depression is associated with biases in reasoning and with reduced estimates of future neutral and future positive events (65).

Strengths and limitations

A lack of findings in relation to image type in the present study may have resulted from the extent of difference in desirability of the image sets, as assessed by participants' ratings of how nice they found each image. Although the DUE images were perceived as significantly nicer than the UUE images, the findings strengthen the evidence that brief exposure to place images elicit changes across the three psychological mechanisms assessed in this study. The images are of typical places in the UK and although the selection of images for each condition were based on ratings from a pilot study (4), the use of more divergent images may allow the effect of place on LoC, CFC and AoT to be more measurable. For example, the use of images containing contextual cues fitting of the "broken window" theory, such as evidence of anti-social behaviour, for example litter or graffiti may have been more appropriate to include in the UUE image condition. A repeated measures approach, with the inclusion of neutral images between the desirable and undesirable image sets may also have allowed for the exploration of within participant changes in LoC, CFC and AoT. The present study extended research by Corcoran et al. (4) by asking participants the same questions as asked for each image, but in relation to their own residence. It is possible that the judgements participants were required to make in relation to these questions while contemplating each image influenced participant responses across the three outcome measures. This is consistent with evidence that it is both the actual and perceived physical and social quality of the urban environment which determines the

urbanicity effect. The inclusion of an image condition without contemplation questions may have allowed the influence of these questions to be fully considered.

The use of a cross-sectional sample, advertising via social media and mental health charities, and inclusion of individuals with a wide range of depression and anxiety levels may be considered a strength of this study and adds to earlier studies of undergraduate student samples (4,40,47). However, this may also have limited the study findings, as participants may have a history or an increased propensity to common mental health disorders. There were significant differences in the study sample across the two image conditions, in age, salary and ethnicity, which limits the comparability of the outcomes in the two image conditions and limits the generalisability of the study findings to a wider population. Use of a larger study sample may have reduced the impact of these differences and allowed for a wider exploration of the results in relation to demographic factors such as ethnicity.

The findings relating to future discounting may have been limited by the format of the decision-making task used in the present study. Alternative methods such as computer-based programs to calculate the overall discounting rate over several trials may have increased the sensitivity of this task (66). The repetition of measures used pre and post image contemplation may have introduced practice effects, whereby the repetition of measures led to further thinking about each question, leading to the differences seen in pre and post contemplation scores, rather than contemplation of the image.

Clinical Implications

The rate of urbanisation is growing and the percentage of the world's population living in urban areas is expected to grow from approximately 55% to 68% by 2050 (United Nations, 2018). There is also growing evidence that living in an urban environment increases the likelihood of developing CMD's such as depression and anxiety, with higher prevalence rates associated with greater levels of urbanisation (1–3). Furthermore, evidence of the transdiagnostic nature of common symptoms of negative affect and psychological distress (25,27), their existence on a continuum in the

general population (26), and the influence of high deprivation (21) highlights the important role of the urban environment in mental health and wellbeing.

There are many aspects of urban environments which are considered to contribute to the impact of the urban environment, including the actual and perceived quality of the environment and the individuals' perception of and response to it (1,7,9-11). The relevance of the urban environment in mental health also increases with high deprivation (21). This study's demonstration of the impact of brief exposure to images of urban environments on three psychological mechanisms thought to underpin the urbanicity effect emphasises the importance of accounting for these relationships in how we make sense of an individual's difficulties through formulation, thus informing treatment. Developing a shared understanding of, for example how environmental cues influence our perception of social disorder and alters our behaviour, may allow an individual who experiences anxiety to develop a deeper understanding of factors which along with increased attention to threat, may be maintaining their difficulties. Interventions aimed at the development of adaptive self-regulatory affective, behavioural and cognitive processes which mediate the way in which individuals deal with and recover from stress or adversity are important to counter the potentially powerful influence of the aspects of the urban environment. Problem solving skills for example could allow an individual to successfully counter the potential of their environment to influence how they make decisions and the increased likelihood that they may discount the future during the decision-making process. Developing resilience and perception of personal control might also allow an individual to develop an adaptive coping style. Developing a greater understanding of the influence of the urban environment also allows treatment options to be carefully considered. For example, a common behavioural intervention used in the treatment of depression is behavioural activation, aimed at increasing an individual's interactions with the environment, reducing isolation and increasing the opportunity to gain positive feedback from the environment (67). Without knowledge of the individual's perception of their wider environment, opportunities to explore potential obstacles or barriers to fully engaging in such interventions may be overlooked. Individuals being discharged from inpatient mental health care may be returning to a threatening environment with high crime rates and low trust, which may

undermine improvements to existing mental health conditions and potentially increasing their risk of relapse and further inpatient treatment. The potential impact of the urban environment, therefore, is an important factor to be taken into consideration in all areas of mental health.

Evidence of increasing prevalence rates, coupled with growing urbanisation highlights the need for preventative measures, in line with the suggestions for addressing health inequality by targeting the social determinants of health and mental health (68). One policy objective of the "Fair Society, Healthy Lives" report proposes the creation and development of healthy sustainable places and communities (68). The use of existing evidence on the influence of the urban environment in the planning and development of urban areas would create opportunities for urban areas to be designed to promote community interaction and community trust. Evidence of the strongest associations between mental health and the highly deprived urban environments, highlights the need to prioritise areas with the highest levels of deprivation in planning and development and public health initiatives (21). McElroy et al.'s study (21) provides evidence of direct and indirect pathways to common and severe mental health disorders in relation to symptoms of paranoia. Their findings suggest a direct pathway between interpersonal threat such as drunken or rowdy behaviour and anxiety and paranoia items, and an indirect pathway between physical cues of social disorder such as vandalism and litter and mental health symptoms mediated by social cohesion factors such as belonging. This highlights the potential for the urban environment to influence mental health and wellbeing, but also the possibility for the urban environment to lead to an escalation of severity of difficulties from common mental health disorders such as anxiety, to more severe disorders such as psychosis (21). Therefore, prioritisation of these direct and indirect pathways in the planning and development of deprived urban areas and a reduction of elements which contribute to deprivation levels, may limit the potential detrimental impact of the urban environment on mental health.

Future research

An unexpected pattern emerged in relation to feelings of personal control in the present sample and this may have been influenced by the questions asked with each image. Future research

might explore the use of control procedures to explore the effect of the questions themselves which may enable further examination of the possible impact of the questions, particularly how they might relate to feelings of personal control. The potential influence of wider resilience factors may also allow for a better understanding of protective factors such as resilience which might mediate the relationship between CMDs and the urban environment. Qualitative research methods to explore the relationship between the images, questions and sense of place may also allow for a richer examination of the influence of the urban environment and CMDs. Finally, the use of more divergent images to represent very desirable and very undesirable images may increase the measurability of the effects seen in this study, together with piloting of images with a non-student sample.

Conclusions

This study has provided evidence that brief contemplation of images of residential urban environments can change how we think. This study has also demonstrated that depression and anxiety influence the extent to which the urban environment exerts its influence, highlighting feelings of personal control and economic decision making in the form of future discounting as worthy of further exploration in this regard.

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APPENDIX A

Submission Guidelines for PLOS ONE

Style and Format

File format	Manuscript files can be in the following formats: DOC, DOCX, or RTF. Microsoft Word documents should not be locked or protected. LaTeX manuscripts must be submitted as PDFs. Read the LaTeX guidelines.
Length	Manuscripts can be any length. There are no restrictions on word count, number of figures, or amount of supporting information. We encourage you to present and discuss your findings concisely.
Font	Use a standard font size and any standard font, except for the font named "Symbol". To add symbols to the manuscript, use the Insert → Symbol function in your word processor or paste in the appropriate Unicode character.
Headings	Limit manuscript sections and sub-sections to 3 heading levels. Make sure heading levels are clearly indicated in the manuscript text.
Layout and spacing	Manuscript text should be double-spaced. Do not format text in multiple columns.
Page and line numbers	Include page numbers and line numbers in the manuscript file. Use continuous line numbers (do not restart the numbering on each page).
Footnotes	Footnotes are not permitted. If your manuscript contains footnotes, move the information into the main text or the reference list, depending on the content.
Language	Manuscripts must be submitted in English. You may submit translations of the manuscript or abstract as supporting information. Read the supporting information guidelines.
Abbreviations	Define abbreviations upon first appearance in the text. Do not use non-standard abbreviations unless they appear at least three times in the text. Keep abbreviations to a minimum.
Reference style	PLOS uses "Vancouver" style, as outlined in the ICMJE sample references. See reference formatting examples and additional instructions below.

Systematic reviews and meta-analyses

A systematic review paper, as defined by The Cochrane Collaboration, is a review of a clearly formulated question that uses explicit, systematic methods to identify, select, and critically appraise relevant research, and to collect and analyze data from the studies that are included in the review. These reviews differ substantially from narrative-based reviews or synthesis articles. Statistical methods (meta-analysis) may or may not be used to analyze and summarize the results of the included studies.

Reports of systematic reviews and meta-analyses must include a completed PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) checklist and flow diagram to accompany the main text. Blank templates are available here:

Checklist: PDF or Word document

Flow diagram: PDF or Word document

Authors must also state in their "Methods" section whether a protocol exists for their systematic review, and if so, provide a copy of the protocol as supporting information and provide the registry number in the abstract.

If your article is a systematic review or a meta-analysis you should:

State this in your cover letter

Select "Research Article" as your article type when submitting

Include the PRISMA flow diagram as Fig 1 (required where applicable)

Include the PRISMA checklist as supporting information

APPENDIX B

		Selection Bias			Study Design			Confounders			Blinding			Data Collection Methods			Withdrawals and dropouts			Intervention Integrity			Analyses				Global rating
		A1	A2		B1			C1	C2		D1	D2		E1	E2		F1	F2		G1	G2	G3	H1	H2	H3	H4	
	Allen	3	5	3	5	2		3	4	3	1	3	3	1	1	1	3	4	3	1	3	1	Ind	Ind	1	2	3
	Ambrose	1	1	1	5	2		1	4	3	1	3	3	3	3	3	2	2	2	1	1	3	Ind	Ind	1	2	3
	Curl 2014	1	3	3	3	2		3	4	3	1	3	3	1	1	1	4	5	n/a	4	3	3	Ind	Ind	1	3	3
	Curl 2015	1	3	3	5	2		3	2	3	1	3	3	3	3	3	4	5	n/a	1	3	3	Ind	Ind	1	3	3
	Egan	2	4	3	4/5	2		1	1	1	1	3	3	1	1	1	4	5	n/a	4	3	3	Ind	Ind	1	2	2
	Huxley	1	3	3	3	2		1	4	3	3	3	3	1	1	1	2	2	2	4	3	3	Ind	Ind	1	3	3
	Kearns	1	3	3	3	2		1	4	3	3	3	3	1	1	1	2	2	2	4	3	3	Ind	Ind	1	3	3

	Jalaludin	1	2	2	5	2		3	4	3	1	1	3	1	1	1	1	1	1	1	3	3	Ind	Ind	1	3	3
	Jongeneel	2	3	3	4/5	2		1	1	1	1	3	3	1	1	1	4	5	n/a	4	3	3	Ind	Ind	1	3	3
	Petticrew	2	3	3	3	2		1	1	1	1	1	3	3	3	3	2	1	1	1	3	1	Ind	Ind	1	1	3
	Ruijsbroek	2	3	3	3	2		1	4	3	1	3	3	1	1	1	4	5	n/a	4	3	3	Ind	Ind	1	2	3
	Stafford	4	5	3	3	2		2	n/a	3	3	3	3	3	3	3	2	2	2	4	3	3	Ind	Ind	1	1	3
	Walthery	4	5	3	3	2		1	1	1	3	3	3	1	1	1	2	4	3	4	3	3	Ind	Ind	1	1	3

APPENDIX C

Participant Information Sheet

Can the contemplation of places change the way we think and feel?

Version Number: 1

Date: 14/05/2015

Researchers: Professor Rhiannon Corcoran, Institute of Psychology Health and Society

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Nasim Choudhri, postgraduate clinical psychology student

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You are being invited to participate in a research study. Before you decide whether to participate, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully. If you would like more information about the study before beginning the web-based experiment please email one of the researchers involved in the study using the email addresses above. Please also feel free to discuss this with other people if you wish. We would like to stress that you do not have to accept this invitation and should only agree to take part if you want to.

What is the purpose of this study?

This is one of a series of studies in which we are trying to find out if and how people's feelings and decisions are influenced by things they may come across in their environment.

Why have I been chosen to take part?

This research is open to anyone over the age of 18 who wants to take part in it.

Do I have to take part?

It is entirely up to you whether or not you take part in this study. If, after reading this information sheet you decide not to take part, you can simply exit the experiment by clicking the 'no thank you' button below. If you decide you would like to take part you simply click the 'next' button below to begin the experiment. If you do decide to take part but then change your mind you can exit the experiment at any time by closing the link.

What will happen if I take part?

If you decide to take part in this web-based experiment you will first be asked to provide your consent to take part by completing the online consent form before proceeding to the experiment itself. Following this you will be asked for a few non-identifying details – your age, sex, ethnic origin, level of income and finally we will ask you to indicate roughly how much experience you have had of being a victim of crime. If you do not want to provide any particular information you do not have to. You can simply leave the item blank. Next you will be asked some questions about your current thoughts, feelings and experiences. These will include, for example, questions about your mood and experience of anxiety, how well you know your neighbours, whether you feel down, anxious or under threat at all. After this you will see a set of photographs of 5 different residential areas. For each of these you'll be asked to rate them in terms of your immediate opinions of 'how nice is the area and what you might expect to come across in the area. Next you will be asked a simple imaginary decision making task about sums of money (please note that no actual payments are made to you as part of this task). There is a further set of questions about your current thoughts, feelings and experiences. Finally you will be asked for your opinions about the area you currently live in such as 'how nice is the area and what you might expect to come across in the area'. In all the study will take you about 20 minutes to complete.

Expenses and or payments

You will be given the chance to enter a free prize draw with 3 x £50 high street vouchers. Of course, if you want to enter the prize draw you will have to leave your contact details so that we can inform you if you have won.

Are there any risks in taking part?

There are no risks in taking part in this study although you may find some of the questions a bit personal. It is important to stress that you do not have to answer any question if you'd prefer not to and you can stop and exit the study at any time.

Are there any benefits in taking part?

There are no direct benefits to you for taking part in this study.

What if I am unhappy or if there is a problem?

If you are unhappy, or if there is a problem, please feel free to let us know by contacting Rhiannon Corcoran on 0151 795 5365 or Rhiannon.corcoran@liverpool.ac.uk and we will try to help. If you remain unhappy or have a

complaint which you feel you cannot come to us with then you should contact the Research Governance Officer on 0151 794 8290 (ethics@liv.ac.uk). When contacting the Research Governance Officer, please provide details of the name or description of the study (so that it can be identified), the researcher(s) involved, and the details of the complaint you wish to make.

Will my participation be kept confidential?

Any information you provide will be kept in confidence and only the researchers directly involved in the project will see your information. It will be downloaded for this secure SurveyMonkey website onto a secure database where your information will be allocated a number. The database will be kept on secure drives at the University of Liverpool for up to 5 years whereupon it will be deleted.

What will happen to the results of the study?

The results of the study will be written up in the form of a final year research project by the student experimenter. It is also possible that the results will form part of a publication in a peer reviewed academic journal. No identifying information will be used in these projects or publications

What will happen if I want to stop taking part?

You can withdraw from this experiment at anytime, without explanation, by exiting the survey. If you exist the survey before completing it, we will not use any of the information you have provided and all the information will be destroyed.

Who can I contact if I have further questions?

If you have any further questions about this research please email Rhiannon Corcoran, the supervisor of the research at: Rhiannon.corcoran@liverpool.ac.uk

APPENDIX D

Consent Form

Can the contemplation of places change the way we think and feel?

Version Number: 1

Date: 14/05/2015

Researchers: Professor Rhiannon Corcoran, Institute of Psychology Health and Society

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Dr Beth Greenhill, Department of Clinical Psychology

bethg@liverpool.ac.uk

Nasim Choudhri, postgraduate clinical psychology student

Nasim.choudhri@liverpool.ac.uk

I confirm that I have read and have understood the information sheet for the above study. I have had the opportunity to sufficiently consider the information.

I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason, and without my rights being affected. In addition, should I not wish to answer any particular question or question, I am free to decline.

If you agree to take part in this study please click the 'confirm' button below

If you do not want to take part in the experiment please click the 'exit study' button below.

○ Confirm

○ Exit Study

APPENDIX E
DEMOGRAPHICS

If at any point during the survey you wish for your data to be deleted please write "Delete" in any of the textboxes that will be given at the end of the page

1. What is your age?

- 18 to 24
- 25 to 34
- 35 to 44
- 45 to 54
- 55 to 64
- 65 to 74
- 75 or older

2. What is your gender?

- Female
- Male

3. What is your ethnic group?

Choose one option that best describes your ethnic group or background

White

1. English/Welsh/Scottish/Northern Irish/British
2. Irish
3. Gypsy or Irish Traveller
4. Any other White background, please describe

Mixed/Multiple ethnic groups

5. White and Black Caribbean
6. White and Black African
7. White and Asian
8. Any other Mixed/Multiple ethnic background, please describe

Asian/Asian British

9. Indian
10. Pakistani
11. Bangladeshi

12. Chinese
13. Any other Asian background, please describe

○ **Black/ African/Caribbean/Black British**

14. African
15. Caribbean
16. Any other Black/African/Caribbean background, please describe

○ **Other ethnic group**

17. Arab
18. Any other ethnic group, please describe

4. What is your annual income?

- Less than £10,000
- £10,000 to £20,000
- £20,000 to £30,000
- £30,000 to £40,000
- £40,000 to £50,000
- £50,000 to £75,000
- £75,000 or more

5. In the last 5 years how often would you consider yourself to have been a victim of crime.

○ 0 - Never
○ Once
○ Twice
○ Three Times
○ Four Times
○ Five Times
○ Six Times
○ Seven Times
○ Eight Times
○ Nine Times
○ Ten Times

APPENDIX F
MEASURES

GAD-7 Anxiety

Over the last 2 weeks, how often have you been bothered by the following problems?	Not at all	Several days	More than half the days	Nearly every day
1. Feeling nervous, anxious or on edge	0	1	2	3
2. Not being able to stop or control worrying	0	1	2	3
3. Worrying too much about different things	0	1	2	3
4. Trouble relaxing	0	1	2	3
5. Being so restless that it is hard to sit still	0	1	2	3
6. Becoming easily annoyed or irritable	0	1	2	3
7. Feeling afraid as if something awful might happen	0	1	2	3

PHQ-9 Depression

Over the last 2 weeks, how often have you been bothered by any of the following problems?	**Not at all**	**Several days**	**More than half the days**	**Nearly every day**
1. Little interest or pleasure in doing things.....……	0	1	2	3
2. Feeling down, depressed, or hopeless.……..……	0	1	2	3
3. Trouble falling or staying asleep, or sleeping too much.....…….……..	0	1	2	3
4. Feeling tired or having little energy.....……...……	0	1	2	3
5. Poor appetite or overeating.....…….…	0	1	2	3
6. Feeling bad about yourself — or that you are a failure or have let yourself or your family down……..	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or watching television……..	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed? Or the opposite — being so fidgety or restless that you have been moving .around a lot more than usual.....……..	0	1	2	3
9. Thoughts that you would be better off dead or of hurting yourself in some way.....……	0	1	2	3

APPENDIX G

Anticipation of threat (Corcoran et al, 2008)

How likely do you think it is that the following things will happen to you in the next week

Response scale: 1= not at all likely – 7 = very likely

Someone tells you to shut up	Not at all likely						Very likely
You're hit by somebody	1	2	3	4	5	6	7
Someone tells you that you're boring	1	2	3	4	5	6	7
You're followed by someone	1	2	3	4	5	6	7
Someone stares at you menacingly	1	2	3	4	5	6	7
Someone tells you a lie	1	2	3	4	5	6	7

Consideration of Future Consequences Scale (Strathman et al., 1994)

For each of the statements below, please indicate whether or not the statement is characteristic of you.

1 = Not at all like you
5 = Very much like you

1. I only act to satisfy immediate concerns, thinking the future will take care of itself.

1. Extremely uncharacteristic

2. Somewhat uncharacteristic

3. Uncertain

4. Somewhat characteristic

5. Extremely characteristic

2. My behavior is only influenced by the immediate (i.e., a matter of days or weeks) outcomes of my actions.

1. Extremely uncharacteristic

2. Somewhat uncharacteristic

3. Uncertain

4. Somewhat characteristic

5. Extremely characteristic

3. I think it is important to take warnings about negative outcomes seriously even if the negative outcome will not occur for many years.

1. Extremely uncharacteristic

2. Somewhat uncharacteristic

3. Uncertain

4. Somewhat characteristic

5. Extremely characteristic

4. **I think it is more important to perform a behavior with important distant consequences than a behavior with less-important immediate consequences.**

1. Extremely uncharacteristic
2. Somewhat uncharacteristic
3. Uncertain
4. Somewhat characteristic
5. Extremely characteristic

5. **I generally ignore warnings about possible future problems because I think the problems will be resolved before they reach crisis level.**

1. Extremely uncharacteristic
2. Somewhat uncharacteristic
3. Uncertain
4. Somewhat characteristic
5. Extremely characteristic

6. **I only act to satisfy immediate concerns, thinking that I will take care of future problems that may occur at a later date.**

1. Extremely uncharacteristic
2. Somewhat uncharacteristic
3. Uncertain
4. Somewhat characteristic
5. Extremely characteristic

7. **I consider how things might be in the future, and try to influence those things with my day to day behavior.**

1. Extremely uncharacteristic
2. Somewhat uncharacteristic
3. Uncertain
4. Somewhat characteristic

5. Extremely characteristic

8. Often I engage in a particular behavior in order to achieve outcomes that may not result for many years.

1. Extremely uncharacteristic

2. Somewhat uncharacteristic

3. Uncertain

4. Somewhat characteristic

5. Extremely characteristic

9. My convenience is a big factor in the decisions I make or the actions I take.

1. Extremely uncharacteristic

2. Somewhat uncharacteristic

3. Uncertain

4. Somewhat characteristic

5. Extremely characteristic

10. I am willing to sacrifice my immediate happiness or well-being in order to achieve future outcomes.

1. Extremely uncharacteristic

2. Somewhat uncharacteristic

3. Uncertain

4. Somewhat characteristic

5. Extremely characteristic

11. I think that sacrificing now is usually unnecessary since future outcomes can be dealt with at a later time.

1. Extremely uncharacteristic

2. Somewhat uncharacteristic

3. Uncertain

4. Somewhat characteristic

5. Extremely characteristic

12. Since my day to day work has specific outcomes, it is more important to me than behaviour that has distant outcomes.

1. Extremely uncharacteristic

2. Somewhat uncharacteristic

3. Uncertain

4. Somewhat characteristic

5. Extremely characteristic

Locus of Control (Rotter, 1966)

For each of the 12 paired statements below, indicate which alternative best describes how you feel.

1.

Many of the unhappy things in people's lives are partly due to bad luck

People's misfortunes result from the mistakes they make.

2.

One of the major reasons why we have wars is because people don't take enough interest in politics.

There will always be wars, no matter how hard people try to prevent them.

3.

In the long run, people get the respect they deserve in this world.

Unfortunately, an individual's worth often passes unrecognized no matter how hard s/he tries.

4.

Without the right breaks, one cannot be an effective leader.

Capable people who fail to become leaders have not taken advantage of their opportunities.

5.

No matter how hard you try, some people just don't like you.

People who can't get others to like them don't understand how to get along with others.

6.

I have often found that what is going to happen will happen.

Trusting to fate has never turned out as well for me as making a decision to take a definite course of action.

7.

In the case of the well prepared student, there is rarely, if ever, such a thing as an unfair test.

Many times exam questions tend to be so unrelated to course work that studying is really useless.

8.

Becoming a success is a matter of hard work; luck has little or nothing to do with it.

Getting a good job depends mainly on being in the right place at the right time.

9.

The average citizen can have an influence in government decisions.

This world is run by the few people in power, and there is not much the little guy can do about it.

10.

When I make plans, I am almost certain that I can make them work.

It is not always wise to plan too far ahead because many things turn out to be a matter of luck anyway.

11.

In my case, getting what I want has little or nothing to do with luck.

Many times we might just as well decide what to do by flipping a coin.

12.

What happens to me is my own doing.

Sometimes I feel that I don't have enough control over the direction my life is taking.

Low or High Resource - Image 1-5 here

1. **How 'nice' is this place on a 0 -5 scale?**

   0 = 'This is the worst place I have ever seen'
   5 = 'This is the best place I have ever seen'

- 0. This is the worst place I have ever seen
- 1.
- 2.
- 3.
- 4.
- 5. This is the best place I have ever seen

2. **How much would you like to live in this place on a 0-5 scale?**

   0= 'I would refuse to live in this place'
   5 = 'I would feel completely content if I lived in this place'

- 0. I would refuse to live in this place
- 1.
- 2.
- 3.
- 4.
- 5. I would feel completely content if I lived in this place

3. **How much would you say that people who live in this place mix with each other on friendly terms on a 0-5 scale?**

   0 = 'I don't think that the people who live here ever mix with each other on friendly terms'
   5 = 'I think that the people who live here mix with each other on friendly terms daily.'

- 0. I don't think that the people who live here ever mix with each other on friendly terms

- 1.
- 2.
- 3.
- 4.
- 5. I think that the people who live here mix with each other on friendly terms daily

4. How much antisocial behavior (e.g. smashed bus shelters, fly tipping, burnt out cars) would you expect to see in this area on a 0-5 scale?

0 = 'I'd expect to see no evidence at all of antisocial behavior on any day that I visited this place'
5 = 'I'd fully expect to see evidence of antisocial behavior on any day that I visited this place'.

- 0.I'd expect to see no evidence at all of antisocial behavior on any day that I visited this place
- 1.
- 2.
- 3.
- 4.
- 5. I'd fully expect to see evidence of antisocial behavior on any day that I visited this place

5. How poor or rich do you think the people who live in this place are on a 0-5 scale?

0 = 'The people who live in this place are likely to be extremely poor'
5 = 'The people who live in this place are likely to be extremely rich'

- 0. The people who live in this place are likely to be extremely poor
- 1.
- 2.
- 3.
- 4.

5. The people who live in this place are likely to be extremely rich

About where you currently live:

1. **How 'nice' is this place on a 0 -5 scale?**

   0 = 'This is the worst place I have ever seen'
   5 = 'This is the best place I have ever seen'

- 0. This is the worst place I have ever seen
- 1.
- 2.
- 3.
- 4.
- 5. This is the best place I have ever seen

2. **How much do you like to live in this place on a 0-5 scale?**

   0= 'I do not like to live in this place'
   5 = 'I feel completely content living in this place'

- 0. I do not like to live in this place
- 1.
- 2.
- 3.
- 4.
- 5. I feel completely content if living in this place

3. **How much are the people who live in this place likely to mix on friendly terms with each other on a 0-5 scale?**

   0 = 'I don't think that the people who live here ever mix with each other on friendly terms'
   5 = 'I think that the people who live here mix with each other on friendly terms daily.'

- 0. I don't think that the people who live here ever mix with each other on friendly terms
- 1.
- 2.
- 3.
- 4.
- 5. I think that the people who live here mix with each other on friendly terms daily

4. How much antisocial behavior do you see in this place (e.g. smashed bus shelters, fly tipping, burnt out cars) on a 0-5 scale?

0 = 'I'd expect to see no evidence at all of antisocial behavior on any day that I visited this place'
5 = 'I'd fully expect to see evidence of antisocial behavior on any day that I visited this place'.

- 0.I'd expect to see no evidence at all of antisocial behavior on any day that I visited this place
- 1.
- 2.
- 3.
- 4.
- 5. I'd fully expect to see evidence of antisocial behavior on any day that I visited this place

5. How rich or poor are the people who live in this place on a 0-5 scale?

0 = 'The people who live in this place are likely to be extremely poor'
5 = 'The people who live in this place are likely to be extremely rich'

- 0. The people who live in this place are likely to be extremely poor
- 1.
- 2.

- 3.
- 4.
- 5. The people who live in this place are likely to be extremely rich

Decision making task:

1. **If you had to choose between accepting £30 now or waiting 90 days to get £100 which would you prefer to do?**

- Accept £30 now.
- Wait 90 days to get £100.

Thank you for participating.

What was the study about?
This is one of a series of studies in which we are trying to find out if and how people's feelings and decisions are influenced by things they come across in their environment.

Who can I contact if I have further questions?
If you have any further questions about this research please contact Rhiannon Corcoran, the principal investigator on 0151 795 5365 or Rhiannon.corcoran@liverpool.ac.uk

1. **If you would like to be included in a prize draw (3 x £50 high street vouchers to be won) please leave your email below.**

2. **If you would be interested in participating in further studies in this area please leave your email below and you will be contacted when more studies are available.**

3. **If you wish for your data to be deleted please provide the word "Delete" in this box.**

Thank you for considering this study.

What was the study about?
This is one of a series of studies in which we are trying to find out if and how people's feelings and decisions are influenced by things they come across in their environment.

Who can I contact if I have further questions?
If you have any further questions about this research please contact Rhiannon Corcoran, the principal investigator on 0151 795 5365 or Rhiannon.corcoran@liverpool.ac.uk

1. **If you would be interested in participating in further studies in this area please leave your email below and you will be contacted when more studies are available.**

APPENDIX H
IMAGE SET FOR DESIRABLE URBAN ENVIRONMENTS CONDITION

APPENDIX I
IMAGE SET FOR UNDESIRABLE URBAN ENVIRONMENTS CONDITION

APPENDIX J

Online Adverts

APPENDIX K
Ethical Approval

From: IPHS Ethics <iphsrec@liverpool.ac.uk>
Date: Wednesday, 10 June 2015 10:52
To: "Corcoran, Rhiannon" <corcoran@liverpool.ac.uk>
Subject: IPHS-1415-LB-222-Can the contemplation of places change the way we think and feel?

Dear Rhiannon

I am pleased to inform you that IPHS Research Ethics Committee has approved your application for ethical approval. Details and conditions of the approval can be found below. .

Ref: IPHS-1415-LB-222
PI / Supervisor: Rhiannon Corcoran
Title: Can the contemplation of places change the way we think and feel?
First Reviewer: Pauline Slade
Second Reviewer: Alex Forsythe
Date of Approval: 10.6.15

The application was APPROVED subject to the following conditions:

Conditions

1 All serious adverse events must be reported to the Sub-Committee within 24 hours of their occurrence, via the Research Governance Officer (ethics@liv.ac.uk).

2 This approval applies for the duration of the research. If it is proposed to extend the duration of the study as specified in the application form, IPHS REC should be notified as follows. If it is proposed to make an amendment to the research, you should notify IPHS REC by following the Notice of Amendment procedure outlined athttp://www.liv.ac.uk/researchethics/amendment%20procedure%209-08.doc.

3 If the named PI / Supervisor leaves the employment of the University during the course of this approval, the approval will lapse. Therefore please contact the Institute's Research Ethics Office at iphsrec@liverpool.ac.uk in order to notify them of a change in PI / Supervisor.

Best Wishes

Liz Brignal
Secretary, IPHS Research Ethics Committee

Email: iphsrec@liv.ac.uk
http://www.liv.ac.uk/psychology-health-and-society/